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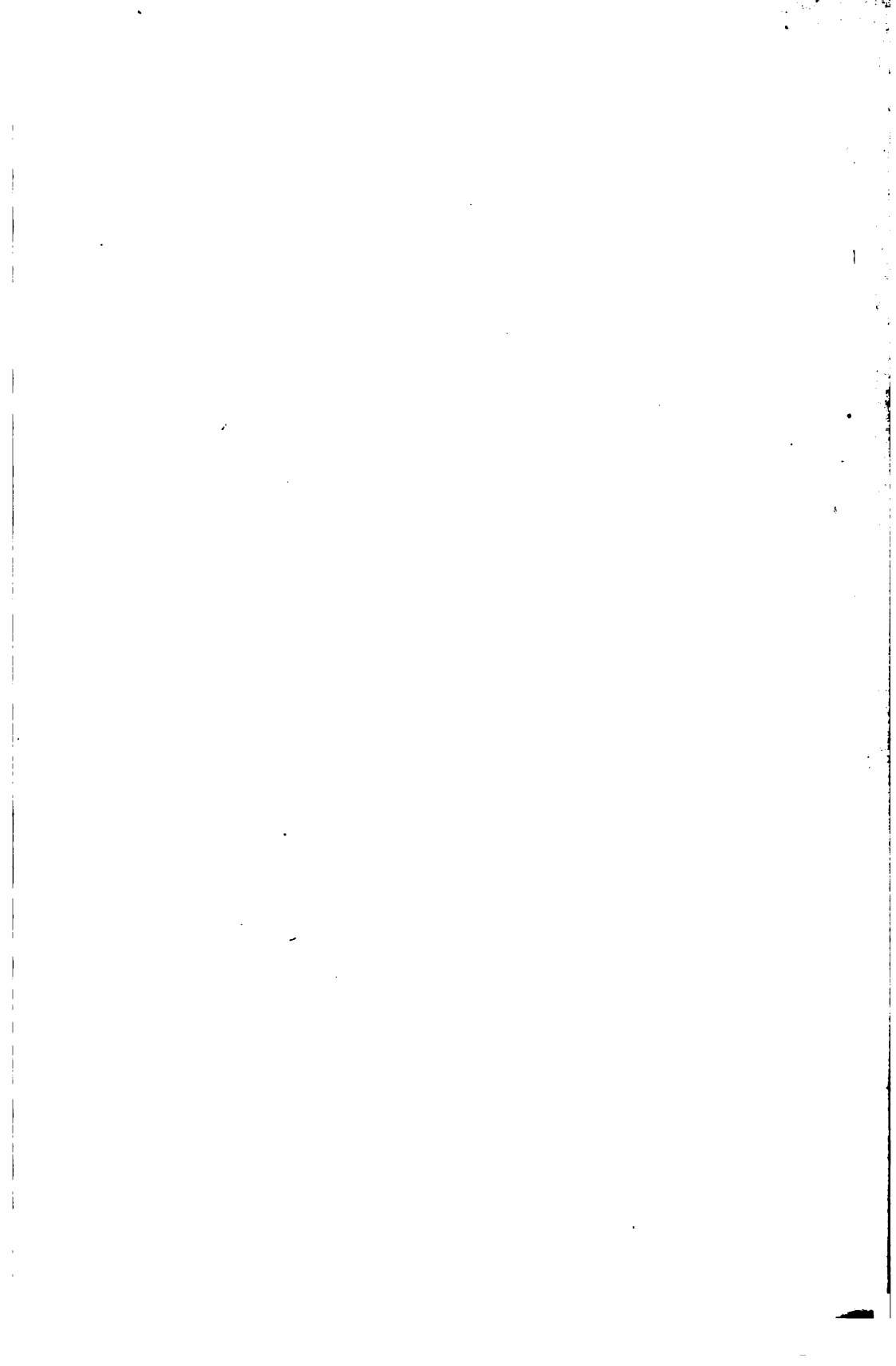
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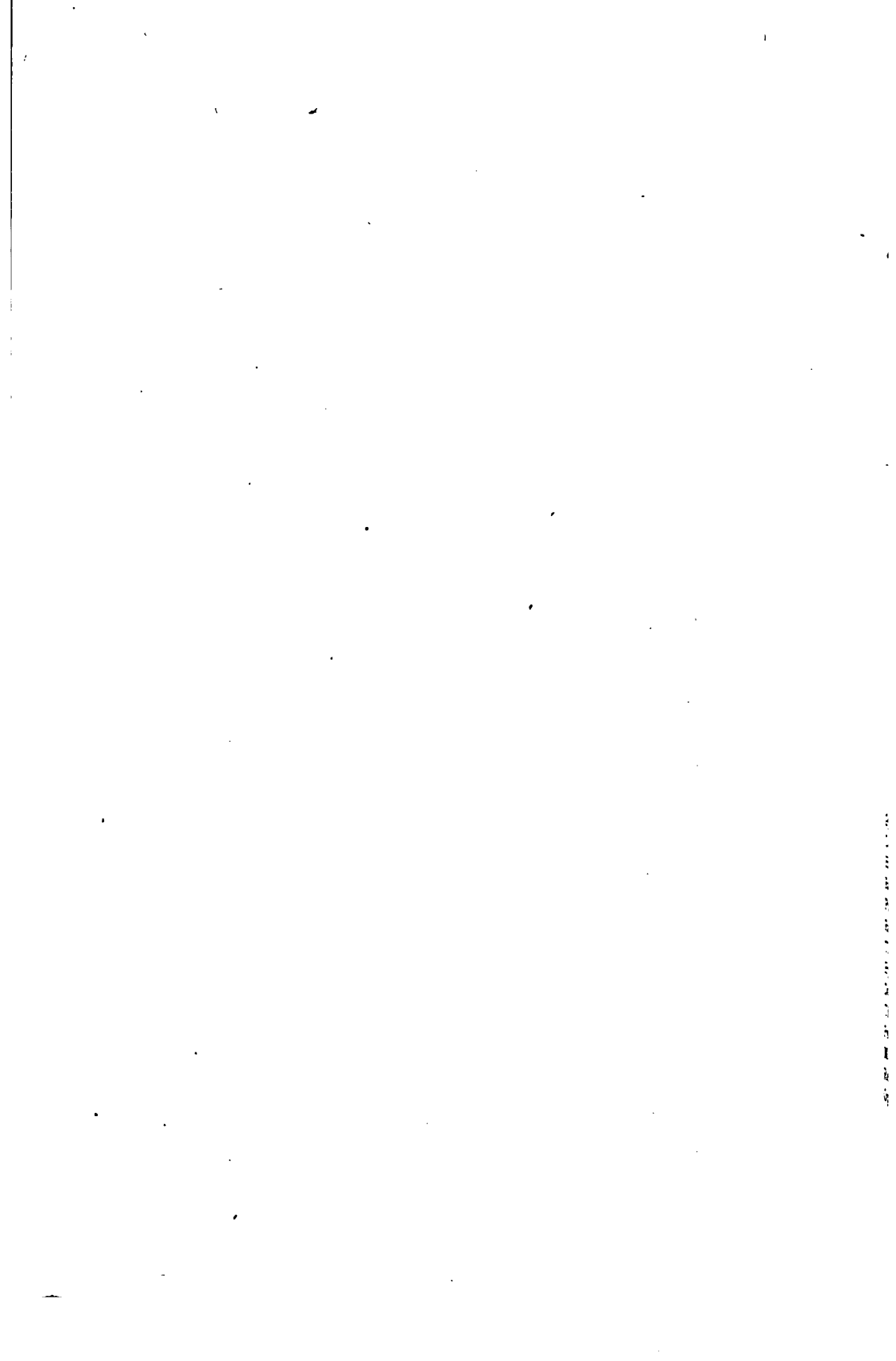
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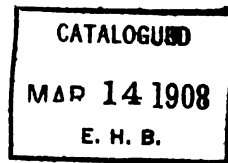
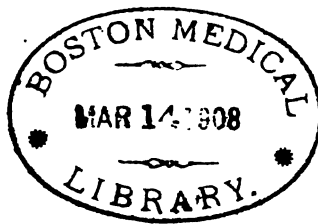
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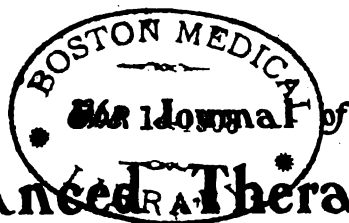
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X-RAY AND LIGHT IN THE TREATMENT OF TUBERCULOSIS.

BY RUSSELL H. BOGGS, M. D., PITTSBURG, PA.

Much has already been said and written about the treatment of tuberculosis in every part of the body, but so far X-ray and light should be traced first as adjuncts in the treatment of this intractable disease, without regard to the location. From the results obtained in the treatment of this disease by the rays no doubt should remain in the mind of anyone that these agents exert a decided, not to say specific influence. Many cases have been successfully treated by the X-ray alone, but in a majority of cases the treatment is made more effective by using X-ray one day and local light the next.

A physician who treats with the X-ray and light, just because he knows certain cases have been cured, and is not familiar with his therapeutic agents, as well as the pathological conditions which exist, is likely to do more harm than good, and bring discredit upon both himself and the treatment. At present there are many placing X-ray and Finsen light apparatus in their offices who know nothing whatever about the physiological action of these agents, and depend upon the manufacturers for their information. It is such men who make so many rash statements, which we should endeavor to correct when possible. Some of these physicians are men of good standing, and have achieved success along other lines, so that when they make these statements they have a powerful bearing, and are detrimental to the advancement of X-ray therapy.

I knew of a case of carcinoma of the breast which was operated upon, and after being treated every other day for six months by a physician of the class addicted to extravagant statements, such as, "My static machine cost \$10,000." In this

*Read at the Thirteenth Annual Meeting of the American Electro-Therapeutic Association at Atlantic City, September 22, 1903.

case the surgeon said: "There is a marked difference in this case and the cases I have operated on where a proper dose *was* given!" He also said: "It is no wonder few surgeons do not believe in X-ray therapy, as this case was treated for six months without even a sign of the rays having been used." This is thoroughly convincing that there is a marked difference in the treatment when properly given, and that X-ray work should not be done by the inexperienced any more than surgery. From my experience, where such a case is properly treated, the operating surgeon must see and admit that the effect of the rays extends through the entire mass.

It is a well-known fact that it is the rays that are absorbed by the tissues that produce the beneficial results. How to best accomplish the absorption of the chemical ray has been given considerable time and study by every operator. Some advocate the use of a static machine and a high tube, while others advocate the use of an induction coil properly constructed and a medium or low tube, and changing the action of the tube when more penetration is desired by increasing the spark gap in series with the tube. The number of advocates of the latter method, both for radiographic and radiotherapeutic work, is rapidly growing.

Why should we cling to a high tube when one rich in the number of rays is preferable? Everyone should admit that the light is best produced by exciting the tube by an induction coil. It has been said by some that a weak light longer continued has more therapeutic properties, but this is certainly a mistake if the therapeutic action of the X-ray is due to the rays that are absorbed. One reason, no doubt, that some operators are using static machines is that their experience has been with an old or inefficient coil.

There is a marked difference in the potential of induction coils, and with some it is necessary, in order to insert a sufficient spark gap in series with the tube, to use nearly the full capacity of the apparatus. Then, we may be compelled to use a stronger current than is wanted. Of course, the current of the static machine has the potential, but it is lacking in volume, besides being an unreliable source of electricity.

In treating pulmonary tuberculosis I use a medium low tube excited by sufficient current to penetrate the chest. When using my 15-inch coil, which has one layer in primary and a mechan-

ical interrupter, ten amperes are used. And with my 18-inch coil which has three layers in the primary and a mercury interrupter, three amperes are used. With the light produced by such a current a normal radiograph of the chest can be made in from one to two minutes, while with a static machine and high tube it would require at least ten minutes' exposure to make a satisfactory radiograph. Of course, chest pictures should be taken in a few seconds. I make this comparison merely to show the degree of light used.

Now, if a static machine was used to excite the tube instead of a coil, it would be necessary to expose the patient very long in order to pass the same amount of X-rays through the chest, and with such exposures would not the skin of the patient's chest be burned to a great extent?

In making radiographs with a static machine it is a difficult task to decide when the plate is properly exposed. Does not the same hold good in radiotherapeutic work? I do not mean to say good work cannot be done by a static machine but only that it is much more difficult.

The selection of a tube has been and is still a difficult task, and even the manufacturers admit that in order to do all kinds of X-ray work it is necessary for the operator to keep a stock of tubes on hand, at least from eight to twelve. If I find a tube that has a particular quality I lay it away for that use. Until tubes are made more perfect it is certainly necessary to resort to some such method. While writing this paper I had sixteen tubes in my office, no two of which would give the same amount of X-rays, that is, the light would not pass through the same density, and affect a plate exactly the same, being excited by the same amount of current for the same length of time.

I have found that with many of the tubes nearly the same results could be obtained by varying the amount of current in the tube and then regulating the amount of spark gap in the series. The terms low, medium, and high, as applied to tubes, are very misleading, and it would be a decided advantage if this Association was to adopt and define certain comparative terms to accurately indicate the grade of the tube. In their published articles one operator will designate as low a tube which backs up a spark of less than three inches between the terminals, while another will praise as a good high tube one

that forces back a spark of not less than four inches. The measure of the spark that a tube will force back is a less reliable method of determining the vacuum than the fluoroscope. However, the continued use of the fluoroscope is dangerous to the operator.

When most operators speak of a low tube they mean one showing the bones of the hand very dark under a fluoroscopic examination, and one when connected to the apparatus without a spark gap has very little power of penetration. Such a tube with an efficient apparatus, and a spark gap inserted in series, will penetrate the body very easily, while the fact that the bones still remain dark under the fluoroscope shows that the vacuum has not been raised in the tube or the light decreased chemically, the only change being the increased penetration. I have been experimenting with spark gaps for more than two years, and have always attempted to secure a tube for radiographic work which was of low vacuum, and would give sufficient penetration when the proper spark gap was inserted. This is the tube I recommend for treating deep-seated conditions. All tubes do not work equally well when using the same length of spark gap, and some work better with scarcely any spark gap.

All tubes are not of proper quality for treating deep-seated conditions any more than every tube has the quality necessary to make radiographs of kidney stones. However, many operators seem to think that any tube will do for treatment.

In treating tuberculosis special attention must be paid to the appetite, digestion, assimilation, and oxygenation, metabolism, and excretion, the very foundations of successful resistance; and repair through the medium of the blood may be gravely interfered with by the use of morphine or other medications to relieve the cough or insomnia. Every X-ray worker has found this to be the case also when treating patients for carcinoma. Cures could often be effected if the patient had not formed the morphine habit before they came for X-ray treatment. The nursing or care of these tubercular cases is very essential, and an effort should be made to have them live outdoors, where they will have an abundant supply of fresh air and sunshine. I noticed marked improvement of one patient only after she had changed her residence from the valley to one of the hills near the city. The diet is very important. Probably there is no other disease where it is so important for

the patient to take a sufficient amount of proper nourishment. Raw eggs make an ideal diet, and in one case I succeeded in having the patient take eight daily.

In the treatment of tuberculosis of the bone it is always advisable to immobilize the part, and for this purpose a felt splint through which the rays will readily pass is serviceable. The part should be examined from time to time to ascertain the results produced by the rays.

It has been my method in most cases to treat with the X-ray every other day, giving an exposure of ten minutes. In pulmonary cases the rays are applied five minutes anteriorly and five minutes posteriorly, and in tuberculosis of the joints five minutes' exposure is given to each side of the limb. However, different joint cases vary greatly in susceptibility to the rays, which is no doubt due to the nutrition being more affected than we can determine in certain cases. It is a well-known fact that when raying normal and abnormal tissues, the normal tissue will scarcely be affected unless the dosage is large, while the abnormal of low vitality will be burned considerably. One of the best illustrations was that of a man whom I treated for skin disease produced by metol while developing pictures. Only parts of his hands were affected. After taking eight treatments a dermatitis occurred in the diseased area, while the healthy parts remained normal, the whole hand having been rayed with a light of the same intensity.

In many cases where the patient is not doing well I give an electric light bath twice a week, which has always been followed by improvement. My electric light bath is somewhat differently constructed from most baths in that the carbons are iron cored, and the arcs have no globes, which allows all the chemical rays, as well as the heat rays, to fall upon the skin, and in from five to eight minutes a slight reddening of the skin similar to a sun-burn will often be produced the first time the bath is taken. Afterwards, as the skin becomes tanned, longer sittings can be given.

I have treated twenty-eight cases of tuberculosis, viz.:

Two cases tubercular ulcers of the larynx, one healed, the other improving.

Five cases of tubercular joints, three cured, another improved, but gave up the treatment, and the fifth improved only for a short time.

Thirteen cases of pulmonary tuberculosis, two cases apparently cured and treatment discontinued, seven improved, and four died (two of these were so weak that they were only able to come for a few treatments; another gained eight pounds in two months when she began to have trouble with her throat, from which time she gradually grew worse; the other improved in weight, and cough and night sweats were checked; then she decided to give up the treatment, as she couldn't see how passing a light through anyone's chest was beneficial, and she gave the credit for her improvement to some trifling home remedies. Three months later when she again had trouble she went to one of our numerous advertising physicians, but just before she died the family physician was called).

Of five cases of tubercular glands, three were apparently cured, and the other two are improving.

Three cases of tubercular ulcers were promptly healed.

Case I. Miss D., age thirty-one, whose aunt and an uncle had died of tuberculosis, began last winter to have trouble with her throat, which gradually grew worse until April 1, when her physician, Dr. McCready, made a diagnosis of tubercular laryngitis, and referred her for X-ray and local light treatment. Dr. Mabon was called to examine her throat, and the examination of the larynx revealed a tubercular ulcer of the commissure, and œdema of both arytenoids. The doctor gave her local treatment in addition to my X-ray treatment for four weeks, when the œdema was entirely relieved and the ulcerous process, if not entirely controlled, was so nearly that visual examination did not reveal any broken surface. Since then irregular treatments have been given and the patient has gained in every way.

Case II. Mrs. C., age 32, had a mother and one sister died of pulmonary tuberculosis. Two years ago she began to cough, had several hemorrhages, and two of our best physicians made a diagnosis of pulmonary tuberculosis. When she came to the office for treatment she had a temperature of 101, night sweats, and a severe cough, and some solidification in the apex of both lungs. Her treatment consisted of a ten-minute exposure every other day for six months, when she was apparently cured. After two months' treatment the night sweats and cough had stopped, and she had gained ten pounds in weight. The last treatment was given fifteen months ago, and the patient is still in good health.

Case III. Mr. H., age 46, had a tubercular knee, which had been affected for three years. Six months before he came a fistula occurred just above the knee. The joint had become ankylosed and Nature was attempting to ward off the trouble.

A radiograph was taken, which showed the above condition. An X-ray treatment of five minutes was given three times a week for two months to each side of the knee, when some dermatitis was produced. Then a few local light treatments were given, which entirely closed the fistula and relieved all the pain.

Case IV. Miss B., age 19, was referred by Dr. McCready for X-ray treatment of a tubercular hip. A radiograph showed some tubercular deposits, and a large amount of effusion present. The treatment consisted of a ten-minute exposure three times a week for two months, when the joint appeared to be in a normal condition. During this time the joint was kept as quiet as possible. It is now six months since the last treatment was given, and she is symptomatically cured.

Case V. Mr. H., age 20, came for X-ray treatment of tubercular glands of the axilla. Before coming he consulted two surgeons, and each advised the removal of the glands. Seven X-ray treatments of ten minutes every third day produced a decided dermatitis, which passed away within two weeks after making the last application. Then the glands were entirely cured and no more treatments have been given. It is now four months since the last treatment and the glands seem to be in a normal condition. The dermatitis of which I spoke was not so severe or troublesome as to prevent him from going to his office and doing his usual work.

Case VI. Miss H., age 10, had been operated on for tubercular glands of the neck. Shortly afterward other glands became affected. After a consultation X-ray therapy was decided upon, which consisted of daily exposures of five minutes for a period of two months, when all signs of the disease in the glands had entirely disappeared. It is now almost a year since the last treatment was given and the glands are perfectly healthy.

Case VII. Miss C., age 19, a Bohemian, was referred by Dr. Shanor with tubercular glands of the neck, with a history of having been operated upon eight months ago for the same trouble. When she came for X-ray treatment there was an involvement of the glands of the right side of the neck to such an extent that it was with difficulty and considerable pain she was able to move her head.

The doctor remarked that he could do nothing for the patient and unless the X-ray could arrest the disease she would live only a few weeks. A ten-minute treatment was given every other day for three weeks, when some dermatitis was produced, the pain entirely relieved, and the glands reduced at least one-third in size. Treatment was then given in the same manner with five-minute exposures. It is now ten weeks since treatment was begun and there has been such a gradual improvement that in another month, if nothing occurs, she will be apparently cured.

I would like to report a case which I treated over four years ago with a static breeze.

Mr. C., age 24, gave a family history of tuberculosis, his mother and sister having died of consumption. When he came to the office there was a tubercular ulcer of the left leg three by four inches, which had been treated by different physicians for eighteen months. The ulcer kept constantly increasing in size.

A static breeze was applied to the part every day for two months, when it was entirely healed. The medicinal treatment consisted of three grains of sulphite of iron three times a day, and the ulcer was protected with ointment of zinc oxide containing five grains of resorcin to the ounce.

316-318, Empire Building.

Discussion.

Dr. C. R. Dickinson asked if Dr. Boggs had made use of the static machine. Personally he had employed the static machine, and thought he had done fairly good work.

Dr. W. B. Snow said that this paper was certainly interesting and instructive, and the results were all that could be desired, but he wished to refer to the point embodied in the question of Dr. Dickson. The speaker said that he did not believe that there was any difference in X-rays—in other words, that X-rays were X-rays. If the static machines were used in varying conditions so as to obtain a greater volume of X-rays these machines could be made in every respect equal to the coil. He made this statement simply because many of us were using the static machine and obtaining good results. There should be no partisanship on this point. If the X-ray use of the static machine were thrown aside this machine would still prove of value in the physician's office; in other words, the therapeutic results obtainable from a coil under certain conditions could not be made to equal those obtained from the static machine. The reader of the paper spoke of the fluoroscope as a better index of the quality of the X-ray tube than the spark gap. It was to be regretted that we had no accurate measure of the relative character of the rays, but the position taken by the author he thought was wrong. One could take a very low vacuum tube in which there was no fluorescence whatever and excite the tube so as to produce a radiance which would show a light image of the bones of the hand upon the fluoroscope just as with a high vacuum tube, and yet the quality of these rays differ. This showed the fallaciousness of the fluoroscopic test. The fact should not be lost sight of that we were dealing at this time with many different kinds of apparatus, a great variety of tubes, and a great variety of interrupters. In this way many confusing factors were introduced. He personally believed practically the same results could be obtained from both coils

and static machines. The doctor's results were certainly most gratifying.

Dr. Robert Reyburn said that this paper brought up the question as to what was the principal action of the X-ray. There was no question that some of these cases were cured by this agency; the question was how? He had been studying this subject, and had come to the conclusion that the morbid cells were surrounded as it were by an inflammatory product, and thus systemic infection was prevented. The same thing was known to occur in cases of tuberculosis of the glands of the neck. This theory seemed to him to explain the action of the X-ray both in tuberculosis and in cases of cancer. The continued action of the X-ray increased the nutrition of the part, and as the tubercle bacillus was known not to be very malignant, it was possible by this agency, aided by proper diet, and regimen to effect a cure. The same general method was applicable to cancer, but the process being far more malignant, the results could not be expected to be so good, and the treatment must be more heroic. If caustic were applied to the tuberculous glands of the neck a similar protecting layer would be formed.

Dr. T. A. Pease said that he was deeply interested in this subject because he had been making a special study of the treatment of tuberculosis. Reference was made to a case of tubercular adenitis of the throat. A young man came to him with two brokendown glands. He was advised to have them curetted, and then submit to the X-ray treatment. He decided to go to a hospital and went to the Victoria Hospital, Montreal. They advised having all of the glands removed. He refused this advice also, and finally went to another hospital and had all of the glands on both sides of the neck removed. At that time there was no evidence of tuberculosis elsewhere. Five months later he came back to the speaker. The glands which had ulcerated before the operation were in the condition they had been found originally, and there were very unsightly scars in the neck, due to careless treatment, and a resulting granulation process. In addition, there was an active tuberculous process in the apex of the right lung, and there was also a tuberculous process in the sternum, from which about half an ounce of pus was removed. The ulcers of the neck were curetted, as also the abscess cavity of the sternum, and the man was treated for five months with the current from the static machine. He was now entirely well and weighed more than ever before. After the cure had been effected he was sent West, and had remained well ever since, now a period of about six years.

Dr. Francis B. Bishop said that the preference for coil or static machine seemed to him to be one of considerable importance. He thought the essayist was in the main right as to the coil giving better results as a rule. The static machine must

be run at a very high rate of speed in order to obtain the same results from a high vacuum tube as could be obtained from a coil, and then it could not always be done without the use of a powerful machine constructed of many plates. For superficial growths the static machine gave just as good results, and perhaps better, because there was less liability of burning the patient, and less liability of breaking the tubes. One could not get the same volume of current through the tubes with the static machine as with the coil. This was often a great drawback. The speaker said that he had three static machines of different sizes and makes. The Holtz machines were practically the same in their effects when the size and number of the plates were considered. He had usually obtained better results from the Toepler machine. So far as the treatment of tuberculosis by the X-ray was concerned, he would say that it offered a great field for research. He now had under observation one or two patients who were improving with only the convective discharge from "a cage" directed upon the shoulders and chest. He had three cases that he felt satisfied were cured. One of them went into the Adirondacks last fall after having been treated for about one year. Every symptom of tuberculosis had disappeared. The cough having returned, she consulted Dr. E. L. Trudeau, who told her there was a bronchial condition of the right lung, and in the left lung there was evidence of a cavity having been healed. On first coming to the speaker, the left apex had been breaking down. He was unable to say how the X-ray cured these cases, but he did not think it did so by surrounding the cells with any protective wall, because if the patient were exposed too long in the beginning of the treatment there was great danger of septic matter being distributed throughout the system, causing general infection. The first action of the X-ray was to produce a drying or glazing over of the parts. The explanations given heretofore in scientific papers, both here and abroad, were that the X-ray produced an overgrowth of the cells and destroyed them by an excess of growth.

Dr. A. D. Rockwell thought that we had in vario-vacuum tubes a method by which one could get over the difficulty associated with high and low tubes. These tubes could be of high penetration or low penetration at will, and with them it seemed to be entirely immaterial whether a static machine or a coil was used. With regard to treatment in alternation by means of the X-ray and light, he would say that he had seen a case of lupus which had been treated very thoroughly abroad by the Finsen light and had ceased improving after reaching a certain point. The lady came under his care and was treated by the X-ray, and immediately began to improve, much to her astonishment and his own. He had reported the case already. It seemed to him that sometimes it was a case of idiosyncrasy.

Dr. G. Z. Goodell said he was treating a girl of thirteen years of tuberculous family taint. Last spring two or three glands were removed from the right side of the neck, and lately two or three others had made their appearance and had been removed. The mother came to him preferring the use of the X-ray. He had been treating her three months, giving about one dozen exposures. The tube was run by a Kinraide coil, and the spark gap was three inches. She was taking internally one of the new soluble iodide preparations. He could not see that the glands were in any way diminished in size.

Dr. Willis P. Spring said he used both the static machine and the coil therapeutically, and thought there was no question but that quicker results could be obtained from the coil than from the static machine. The effect of the X-ray upon the chemical plate seemed to him a good evidence of the effect that would be obtained upon the tissues. He had had a case of very badly infiltrated and inflamed hand with a question of a fracture of the metacarpal bone. He had tried to take a picture of the same hand with the static machine, but had not been able to make a satisfactory picture of the metacarpal bones. At that time he had a six-inch coil, and a mechanical vibrator. Two Cramer plates were taken and an exposure was made with the static machine and with the six-inch coil, and then both plates were developed in the same tray. The one from the static machine showed hardly any metacarpal bone, while the picture made with the coil showed the metacarpal bone very satisfactorily. The static machine employed was a Toepler-Holtz of eight revolving plates, and in the dry atmosphere of Minnesota this was equivalent to a machine of ten or more plates in the atmosphere of New York.

Dr. Boggs said he did not mean to have anyone infer that good work could not be done with the static machine, but he was certain that such work with the static machine was much more difficult to do, and it was decidedly more difficult to determine the requisite dosage. One day one might obtain a beautiful fluoroscopic view of the chest, while with the same tube the next day the image might be very inferior. He had obtained fairly good radiographs with the static machine, but he never knew when the plate had been properly exposed. With the coil he could determine this quite accurately. He used an eight-plate Wagner machine at 2000 revolutions per minute. It would give a fourteen-inch spark. He was of the opinion that with the static machine the rays did not penetrate because not backed up by sufficient force. Most of the cases he had treated had been with the X-ray rather than with the light. In many of them a distressing cough could be quickly relieved by the light treatment, and this relief would last for several hours.

ELECTROTHERAPY AS A SPECIALTY.*

BY A. W. DAYLISS, M. D., BUFFALO, N. Y.

The subject I have chosen is rather out of the ordinary, but I hope to give some ideas for thought along the line of electro-therapeutics.

In considering electro-therapeutics as a specialty, I want first to call your attention to the fact that many still think as I did, that they can start in this line of work with little or no preparation for it, and that it is a work that can be done by anyone, regardless of knowledge of the subject. That was never possible, and to-day the field for the use of electro-therapeutics is so broad that he who poses as being able to apply it must be well informed in all of the branches of medicine. He must be equal to the general surgeon in the knowledge he has of anatomy and the diseases of the body. He must be a specialist in general, being quite able to diagnose the most difficult cases, as well as to make the proper applications to produce the desired effect, also to interpret the different objects that appear on the negative after exposure to the rays. Not only that, but he must know how to place the parts in position that he may bring out to the best advantage the condition present. This leads us to think for a moment of the use of the X-ray in the field of the specialist. He must be able to show to physicians what he can see himself, which is not always easy, especially when he is examining the soft parts, for many (both laity and physician) expect to see objects on the plate as plainly as they can see the fingers on their hands, not realizing that this is only one aid in arriving at a diagnosis of the condition present. There is much change in the understanding of physicians to-day compared with a year ago in this respect. They begin to look upon the X-ray as an assistant and quite often give it the heavy part of the load to bear.

It is only within a few years that we have been called upon to treat the class of cases that we do now. Formerly, after the patient had exhausted all means, including their funds, they then wandered in an aimless and hopeless way to the electro-therapist as a drowning person catches at a straw, but

* Read at the Thirteenth Annual Meeting of the American Electro-Therapeutic Association at Atlantic City, September 22, 1903.

now it is different. The patient is now sent to us the first thing, either for a diagnosis or treatment. There are rules set down by the pioneers in this science which keep us in the right path, yet there are so many different forms of disease met with that we must be original in many cases if we are to succeed. It is only within the past three or four years that there has been such a recognition of electro-therapists by the physician at large. Formerly to be an electro-therapist was to be classed with the charlatans. Now he has a standing in the profession, associating with the foremost physicians of the country and is often called in to settle disputed points in diagnosis. They are beginning to realize, as we do, that this science can do something.

I think there is no specialty in medicine to-day, which has so wide a field of application as this, unless it is general surgery and general medicine. To be proficient in electricity we must not only be familiar with the mechanics, but also accomplished neurologists, gynecologists, dermatologists, ophthalmologists, and in fact all the other specialties, and must be well posted in all, as we have often to confirm or dispute the diagnosis of the expert. In the treatment of all cases we must be able to explain the line of treatment, the effect upon the pathological condition; how we expect to correct it; the length of time it will take, and to make as nearly an accurate prognosis as possible.

I have considered electro-therapeutics in general terms, which is allowing too wide a field, for to-day this science covers more than any one person can become expert in. There is in this country a tendency of the electro-therapist to work along special lines;—the radiographer to confine himself almost entirely to that branch, and the physician whose main reliance is the continuous current to its use. We are unconsciously arriving at the same state that our older brothers across the water have; where the man who uses it confines himself entirely to the continuous current—in fact, has no other appliance to work with unless it be a Faradic battery. Several instances of this kind can be seen in England, especially at the London General Hospital. Dr. Hedley is there the supervising electro-therapist, but his work is confined to the continuous and induced currents, doing nothing that I saw in any other line. A separate head is over each department. In the X-ray room one physician with nurses and assistants does the actual work. In the Finsen light department the same condition is seen, a physician in charge with a head nurse and her assistants attending to the actual work. I was told that in this hospital alone they treat upon an average about seventy patients per day, and I do not doubt it, for there were employed in the different electrical departments about twenty to twenty-five peo-

ple. We can there see people from all parts of the globe; brought there by the reputation of the institution, which is due to the special and systematic work done.

In all the hospitals which I visited in that city the same specializing was characteristic. In St. Bartholmew's Hospital Dr. Lewis Jones had the same systematic method; his own work being confined mostly to diagnosis and operation work with the continuous current, having others to attend to the other departments. I wish to express to you the courtesy with which I was treated there. The more noted the man I met, the more trouble he put himself to to make my visit both pleasant and profitable. I will especially mention the names of Drs. Jones, Hedley, and Shenton, whom I found very kind and obliging to strangers. From such men as these we may expect much in the way of scientific research, but it is such as we get from the physician who confines himself entirely to one subject, he is apt to see more in that one line than his neighbor is able to, and the tendency is to narrow his usefulness unless he is situated where he can command a large clientèle. For, as I said, this field is so broad that if we do not confine ourselves to one special line we may accomplish more in the amount of work done, but we will not do that work in as careful and scientific a manner as we would if we confined ourselves to one special line of work. In the whole range of medicine there are not two points farther apart than the application of electricity for the cure of disease and the application of the X-ray for diagnosis. You seldom see one who is an expert in both lines of work.

We should be careful in giving the prognosis until we have seen the effect of the application, or we may do ourselves and the science an injustice by promising too much. The young man with some experience is often too sanguine of the work he can accomplish with this agent, and may convey the same to his patients only to be disappointed in the result. In the practice of medicine we are often doomed to disappointments. To the physician with an established practice such advice as this is superfluous. The pioneers in this science have worked long and hard to place us in the position we now hold as members of the American Electro-Therapeutic Association, which is known and respected throughout the scientific world, and with which all who follow this science should associate to advantage in the work of mutual education.

592 Spring Street,

Discussion.

Dr. A. D. Rockwell said that it seemed to him that no one except those moving on narrow lines desired to be called electrotheraputists because, in his opinion, it was impossible to make a specialty of a single agent like electricity, just as was done, for example, with ophthalmology and gynecology. Electro-

therapy should be regarded as something of value to the whole profession, but he thought it wise not to speak of it as a specialty in medicine. He had never felt more humiliated in his life than when a physician at a bedside told the patient that Dr. Rockwell only practiced electro-therapy.

Dr. R. J. Nunn said that radiography was one of those things which he did not think any physician in regular practice had the time to devote to, nor did he usually have the skill. It occupied about the place in X-ray work that a photographer had in Finsen work. The great efficiency of radiographic work was in the photographic department. A surgeon or physician who desired a good radiograph should have the work done by an expert radiographer. He thought it would be very much better if those who had natural ability for radiography should confine themselves to that. Some radiographs were merely sketches, while others brought out the minute details; the difference was dependent upon the mode of development.

Dr. W. B. Snow said he had listened to the paper with great interest, but saw a disposition in it to make electro-therapy a specialty, and also to confine the treatment in too narrow spheres. The best interests of the patient did not demand that one particular form of electricity should be used for every case coming for treatment except when experience had shown it to be the best. Our study should be to lead to a practical knowledge of the employment of all the forms of electricity and the proper selection of them for the individual cases. It was another matter, of course, to make a specialty of a certain line of work, as had been done by the late Dr. Newman, and as had just been suggested by Dr. Nunn, but this would not be possible except in large towns because it would not afford a livelihood. He disliked the word "electro-therapeutist" and thought we should prefer to be called "physicians."

Dr. Bayliss, in closing the discussion, said that he thought no physician who pretended to use electro-therapy should be content to work without a complete outfit; he should have the continuous current, the interrupted current, the static machine, etc. If this were not the case the disposition was to use one or two methods only for all cases, to the exclusion of everything else. He had spent several days with Dr. Hedley, whose work was confined almost entirely to neurological diagnosis, but such special work could only be done in a few large places, and he did not think the best scientific results would be obtained from those who were dabbling in all the various branches of electricity; certainly the work of the radiographer should be separate and distinct from the other methods.

REPORT OF THE COMMITTEE ON CURRENT
CLASSIFICATION AND NOMENCLATURE.*

NEW YORK CITY, Sept. 21, 1903.

Chairman of the Executive Committee, American Electro-Therapeutic Association.

DEAR SIR:

The Special Committee chosen at the meeting of September, 1901, to investigate the nature of the currents used in medical practice, submitted a partial report at the meeting of September, 1902. This report was confined to the statement and recommendation of a scheme of terminology appropriate to the various currents, among others those used, as we were informed, by members of this Association and others who are working along the same lines.

The Committee endeavored to secure a wide publication and circulation of that partial report, and specifically invited criticism and comment from readers thereof, in the hope that any inaccuracies or deficiencies might be discovered and corrected before the present meeting. In addition to its publication in the JOURNAL OF ADVANCED THERAPEUTICS, Vol. XXI., pp. 27-35, January, 1903, the Committee printed about 500 copies in pamphlet form, of which number upwards of 400 were distributed to a selected list of prominent members of the American Institute of Electrical Engineers, accompanied by a special printed note of introduction, requesting frank and free criticism.

Only one criticism has been received. It is contained in a letter from Professor C. F. Burgess of the University of Wisconsin, member of the Institute. He wrote as follows, under date of March 9, 1903:

"It does not appear to me that the definition of Voltaic current is entirely correct, inasmuch as voltaic battery and storage battery are assumed to be different devices. A storage cell is a reversible voltaic cell and for this reason a definition something as follows appears to be more satisfactory: 'A current due primarily to voltaic action such as is set up in a primary battery, storage battery, or other electro-chemical source. On page 4 (page 30, JOURNAL OF ADVANCED THERA-

* Read at the Thirteenth Annual Meeting of the American Electro-Therapeutic Association, at Atlantic City, on September 24, 1903.

PEUTICS, Vol. XXI.), this same criticism would again apply in the sentence beginning, 'Galvanic and storage batteries,' which should read: 'Primary cells and storage batteries.'"

This is evidently an improvement in the phrasing of the report in two sentences, both being made clearer and more precise. It does not alter the basis of classification.

The Committee has received a few commendatory and appreciative letters.

Dr. W. J. Morton, writing under date of September 24, 1902, used the following expressions:

"I am glad to see that the report is like the young minister's first sermon, inasmuch as it begins at the deluge and comes down to the present time. In other words it comprises, as it doubtless should, the whole field of currents. . . This report is certainly a most valuable contribution to the entire subject, and most admirably concise and well arranged. I congratulate the Committee on their work and on this good beginning."

Dr. C. E. Skinner, Secretary of the Association, in a letter dated February 24th last, stated that:

"The report of this Committee has been received with enthusiasm by the members."

Again, under date of March 19th, he wrote:

"I wish to express personally my appreciation of the work which has been done by your Committee, and of the tangible results which have been accomplished. This is a move in the right direction, and I sincerely hope the Committee will continue to carry it on in the same excellent way in which it has been begun."

Dr. Walter B. Platt, well known to many of you as a prominent physician and surgeon of Baltimore, and a Fellow of the Royal College of Surgeons of London, England, wrote last spring regarding the report:

"I am sure it will be a great addition to the knowledge of physicians, whose physics is not as good as their physic."

Dr. M. A. Cleaves, in the opening pages of a paper on "The Therapeutics of the Continuous Current," in the September issue of the JOURNAL OF ADVANCED THERAPEUTICS, Vol. XXI., after referring (pp. 534-535) to the report of this Committee last year, writes:

"The current produced by a continuous E. M. F. is known among physicians almost exclusively as the *galvanic current*,

and its use is often spoken of as *galvanism* and *galvanization*. This nomenclature is unscientific. The electrical engineer knows nothing of the galvanic current. When using a continuous E. M. F., the current produced in the working circuit, no matter what its nature, is known as a continuous current, and it detracts naught from the honor due Galvani to adopt a scientific nomenclature. Confusion will exist in the minds of medical men and progress will be impeded so long as electro-therapeutists use an unscientific and meaningless nomenclature, a nomenclature loaded with the names of men who, in most instances, have simply observed and applied the well-known and classic phenomena of the various electro-motive forces. In this presentation of the subject, then, it must be borne in mind that the term galvanic current will never be used and that the phrasing *continuous current* will take its place. And in so far as it is necessary, in a discussion of continuous current phenomena, to speak of alternating currents, the dissymmetrical type of an alternating E. M. F., commonly known as faradic, will always be referred to as an induced current, or better, magnetic-induced."

Taking into consideration the fact that our report of last year has thus been brought to the notice of a large number of people who are exceptionally active in branches of electrical science that are advancing by leaps and bounds, the small number of comments received by the Committee would seem to indicate that no general criticism of the subject matter of the report is likely to be made, and that this Association is, after the lapse of a year, allowed for the accumulation of such criticism, justified in formally adopting the plan of nomenclature which that report presented, and in recommending its introduction and use in the published literature of this body and the discussions to which future papers and reports may give rise.

The Committee suggests that a resolution be adopted recommending the abandonment of the terms, "Franklinic," "Faradic," "Galvanic," "Hertzian," etc., and the substitution of the terms proposed and defined in that report, which are recognized as technically accurate by the great electrical engineering societies of the world.

In the opinion of your Committee, such substitution will not only place the publications and discussions of this Association side by side in technical accuracy with those of the

electrical engineers, but lead to an incalculable advantage to all electro-therapeutic practitioners by accustoming them to think, as well as to talk and write, in terms which everywhere indicate definite and precise apparatus and phenomena, instead of in terms which mean nothing to the great body of electrical workers outside of your own special field, and hence are confusing rather than helpful to the students of to-day, who will constitute the active and progressive profession of a few years hence.

In writing the article above quoted, Dr. Cleaves has, in the judgment of your Committee, struck the chord to which all instruments should be tuned. It will take time to readjust your terminology, but with a concerted effort by the membership of this Association, leading the medical fraternity throughout the world, it can be done without friction. It will greatly assist in securing to your special branch of the healing art the respect, confidence, and co-operation of all fellow workers in the broader field of general electrical application.

In attempting to analyze the peculiarities of the currents used in medical practice, your Committee naturally commenced with those primarily derived from electro-static generators such as the modern Holtz influence machines. We were at once confronted with the fact that no adequate tests had been made as to the output or efficiency of these direct-current generators, and were obliged to borrow representative machines and place them under systematic test conditions. This was not as simple a matter as would at first appear, for serviceable Holtz machines are usually kept exceptionally busy, and orders were found to be far in excess of the ability of nearby manufacturers to supply. After several months of enforced waiting, two such machines were successively borrowed and installed in the laboratory of the Brooklyn Polytechnic Institute, where Dr. Sheldon occupies the chair of Professor of Physics and Electrical Engineering.

In his statement which forms the second part of this report, Dr. Sheldon has summarized the results of several weeks of trial, under varying atmospheric conditions. These preliminary results constitute a most important portion of our work as a Committee, but in order to fully utilize them the tests should be continued in various directions which we will not attempt to outline here. It is sufficient to say that a plan has

been formed and will be followed out by Dr Sheldon, with the general co-operation of the other members of the Committee, in case the Association approves the course thus far pursued and requests the Committee to continue its work. Whatever results are reported next year will thus bear the endorsement of Professor Elihu Thomson, whose continued co-operation cannot fail to be of the highest importance.

It will be seen that in his letter forming the third part of this report, Professor Thomson concisely expresses the importance of careful investigation of the ground thus explored by Professor Sheldon, and states his idea of the value of the results already secured.

In the remaining documents attached hereto, Mr. Jenks and Mr. Clarke have prepared and presented a number of diagrams indicating the combinations of primary static generators and secondary or modifying apparatus which, by published articles which have fallen into the hands of the Committee and replies to inquiries which it has sent out, are shown to be actually used by physicians, either practically and regularly or experimentally; also, as an aid to comparison, diagrams of the old plans of Cavallo and Duchenne. It will on reflection be evident to every intelligent member of the Association or other reader of this report that any classification of such arrangements and combinations must be based primarily upon the curves which properly represent the resulting currents; also that the form of any one of those curves may be varied by the introduction or removal of any given piece of apparatus into or from the circuit outside the terminals of the Holtz machine, or by the readjustment of any piece of apparatus used in securing the data for plotting that curve.

Hence, it may be said, broadly, that all that can be done in advance of further actual test based upon a combination, is to state what may be expected from it under normal conditions of speed of the generator, length of spark gap, resistance, condensance and inductance of circuit, etc, adapting the current to stated and ordinary circumstances, and without a knowledge of the effect of the introduction of the human body into the circuit.

The Committee invites the fullest and frankest criticism as to conditions or methods of the tests here indicated. The members of the Committee feel that it will be difficult for them to

reach practically valuable conclusions regarding this branch of the subject without the active participation of the medical members of this Association and others interested; and will welcome correspondence as to special arrangements of extraordinary conditions of use of any apparatus employed by physicians. We have no preconceived theories to sustain. Our desire is that we may assist in arriving at a knowledge of the truth in this grandest and most vital to human well-being of all the applications of the marvelous form of energy which is even yet so imperfectly understood and appreciated.

The Committee desires to acknowledge the cordial co-operation of Messrs. Waite and Bartlett, shown by the loan of the Holtz machine to Dr. Sheldon for several weeks. Also that of Dr. W. J. Morton in similarly favoring the Committee with a machine of the same general character which is still in the hands of Dr. Sheldon at the Institute. Also that of Messrs. Van Houten and TenBroeck, who transported and adjusted for use Dr. Morton's generator. Also that of Mr. Charles L. Clarke, Member A. I. E. E., who has continued the valuable assistance rendered to the Committee last year by bringing to its aid his ability as a mathematician and his acquaintance with German and French electrical literature.

Respectfully submitted for the Committee,

W. J. JENKS,

Chairman.

(To be continued)



A CASE OF LEUKÆMIA TREATED BY THE X-RAY.*

BY HERMAN GRAD, M. D.

I have the pleasure of presenting this evening a case which is of interest to all of us who work with the Roentgen rays. The case illustrates in a measure the great forward step in therapeutics that the Roentgen rays have made possible. It shows that the possibilities of this great and potent physical force in medicine are enormous. Already it has done wonders in therapeutics, although we understand its application but feebly. We know not the whys and wherefores of it. We are in the dark about it and therefore it behooves us to watch its physiological actions and make memorandums of the cause so that by and by wholesome conclusions may be drawn from these reports, and thus advance therapeutics. Since October 7, I have had under my care a case of leukæmia, a case which promises fairly good results. When the case presented itself there were present enormous glandular enlargements all over the body; wherever glands can be palpated, large bunches of them could be felt. Especially was this the case with the axilla, groin, and neck. The case was carefully diagnosed in one of our large hospitals, and the gentlemen there still manifest great interest in it, as they have only recently requested him to return from time to time. The history of the case is as follows: Patient is sixty-nine years old. In May, 1903, he noticed loss of weight and strength, and at the same time observed enlargement of his glands in the axilla. Soon after progressive enlargement of the glands of the neck took place, as well as those of the groin. A blood examination revealed the true condition and the patient was given X-ray treatments early in July. He received then three treatments, and as no appreciable effect was noticed the treatment was abandoned and the patient was placed on a course of treatment with arsenic. The result was a very violent attack of diarrhea, in which the patient says he nearly lost his life. He was finally taken to the hospital, where he received during the month of September eight Roentgen ray treatments.

On October 7, when he presented himself at my office, he was very feeble, skin very pale, neck enormously enlarged.

* Read before the Clinical Society of the New York School of Physical Therapeutics, Monday evening, November 20, 1903.

Large glandular masses were felt in the axilla and groin. Spleen was greatly enlarged, reaching below the umbilical line. The gland was distinctly palpable. With percussion the organ could be outlined with ease. Temperature and pulse were normal.

I shall take the liberty of refreshing your memory a little about this strange, as well as interesting, affection. The disease was first carefully studied by that giant watch-tower in medicine, Rudolph Virchow, and, strange to say, the disease was simultaneously studied by Bennet. Nothing is known of the etiology of the disease. The young as well as the old may be afflicted. It has occurred in the young as early as the tenth week, and in the old as late as seventy years. My patient here is sixty-nine years old. A case is on record where a healthy mother bore a leukæmic child. An investigator has described a parasite, the *hæmamoeba leukæmiæ*, which he claims is the cause of the disease, but his views have not been accepted. It has been found that lower animals are subject to the same affection.

Leukæmia is characterized by certain changes in the blood, enlargement of glands and spleen, and alteration in the bone marrow. The disease is recognized in two forms. The spleno-medullary and the lymphatic type. The spleno-medullary is the more chronic, the lymphatic is apt to be acute. This classification is of the utmost importance from the diagnostic point of view. In the spleno-medullary form the pathologic changes are mostly confined to the spleen and bone interior, while in the lymphatic the glandular structures are mostly affected. While this holds good generally it may happen that in the lymphatic form a very large spleen will be present, although the enlargement of the organ is never as great as in the spleno-myelogenous form. Ehrlich prefers the name of "myelogenous leukæmia," for the latter form, believing that the changes in the spleen are merely secondary. While it is possible to diagnosticate these two forms of leukæmia from the symptoms presented by the patient, yet no absolute reliance should be placed on gross appearance alone, as a mistake in the diagnosis is apt to be made. The only absolute guide in the differentiation of the two types is from the blood examination. Here we have definite data to go by. The so-called triacid stain of blood has made it possible to make this differentiation.

In the spleno-medullary type we find the myelocytes predominating, while in the lymphatic form we have the lymphocytes in larger numbers. In both types of the disease the distinctive feature is an enormous increase of the white blood corpuscles. Normally, the human blood contains about 5,000,000 r. b. c. to the cubic millimeter, and about 7000 white blood corpuscles, the proportion being one of the latter to 600 of the former. In leukæmia the increase of the white blood corpuscles becomes enormous. The number of leucocytes in a cubic millimeter of blood in leukæmia may be, according to Cabot, as many as 1,072,222, or down to 98,000, the average being 438,000. This increase, however, in the white blood corpuscles of the blood in leukæmia differs in marked characteristics from an ordinary leucocytosis. In pneumonia, for example, we may have a marked increase in the white blood corpuscles of the blood, although never as great as in leukæmia, yet this augmentation of white cells is not the same as in leukæmia. In leucocytosis all the varieties of the white blood corpuscles are increased, while in leukæmia only certain varieties of the white cells are augmented. Thus in the spleno-myelogenous type of leukæmia the so-called myelocytes are augmented, while in the lymphatic leukæmia the so-called lymphocytes predominate. This differentiation of the varieties of the white blood corpuscles is the diagnostic feature of the types of leukæmia. It is also by means of the blood examination that a differential diagnosis is made between Hodgkin's disease and leukæmia. In both affections the gross clinical symptoms being enlargement of the lymphatics and spleen. In Hodgkin's disease, however, if blood changes are present, they are very insignificant.

Since October 7, the patient received twenty-five X-ray exposures, the average time for each exposure was twenty minutes. Counting up the total time during which he was exposed it amounted to eight hours and fifteen minutes. The first twelve treatments were given daily. Although no skin manifestations were observable up to this time a marked systemic reaction took place; then his temperature rose to 103° F., pulse 110. The toxæmia lasted three days. During this time the patient suffered with restlessness, anorexia, diarrhea and headache. The kidney function appeared augmented. I cannot tell whether he secreted more urine than normally, as the

amount of urine was not measured, but the patient complained of frequent urination and excessive amounts. During the first day of the symptoms of toxæmia the patient had twelve movements; the following twenty-four hours, eight; after this the diarrhea subsided. The movements were watery and painless. Coincident with the toxic symptoms the percussion area of the spleen became considerably reduced, although long before this a diminution of the lymphatic enlargement became visible. Up to this time, however, very little impression was made on the glandular enlargements of the neck, although they had been subjected to vigorous X-radiation. A few days after the toxic symptoms appeared the patient complained of a sensation of tightness in the skin of the abdominal region. From this time on the abdomen and spleen were not subjected to the rays. The following thirteen treatments were given on alternate days only. One day the anode of the tube was made to point on the axillæ and with the next treatment the anode was pointed to the side of the neck. In this way each region of the chest and neck would receive an equal amount of exposures. The equalization of the exposure, I believe, is of great importance, as skin lesions are thereby avoided, and the patient can be subjected to many more exposures. That the desired therapeutic effects of the X-rays can be obtained without producing the so-called X-ray burns this case amply shows. At no time during the treatment did the patient suffer with X-ray dermatitis. Just as soon as the patient complained of a sense of tightness over the abdomen, this region was left alone, no further exposures being given. The retrograde changes in the glands of the groin, nevertheless, seemed to go on. After six exposures of the axilla and chest, the patient complained of a sense of itching of the nipple. It is of importance to pay heed to these complaints as a severe dermatitis is apt to result, unless preventive measures are adopted against the possible dermatitis of this region. The nipples are peculiarly sensitive to the Roentgen rays, and if a dermatitis results there, the healing of the part is apt to be slow. It is therefore best to prevent the occurrence. This can be easily accomplished by protecting the nipples with a piece of lead tinfoil cut of the size of a silver dollar. These pieces of tinfoil can be tied over the nipples.

The technique of the treatment of this case was the follow-

ing: A 30-inch 12-plate static machine was used to excite the X-ray tube. The tube was one of medium vacuum backing up a 3-inch spark gap, the speed of the machine being 280 revolutions a minute. The distance of the anode to the parts exposed being from seven to eight inches. The anode would be allowed to point in one direction for five to six minutes, and then would be moved a few inches to the right or left, depending on the region to be exposed, no shields except those of the nipples and scalp being used. In exposing the abdomen and groins the patient is made to recline on a table and the anode of the tube is made to point over the spleen, allowing the tube to remain here from six to eight minutes; the left groin is next exposed and finally the right one; the whole exposure lasting twenty minutes. The next day the chest, neck, and axilla are similarly exposed. On subsequent days the axilla neck, and spleen are exposed from behind forward, the patient lying on the abdomen. During the course of treatment the patient received no internal treatment excepting for a few weeks he has been taking a teaspoonful of oriferum, t. i. d.

115 E. 116th Street, New York.



THE THERAPEUTICS OF THE CONTINUOUS CURRENT.

BY MARGARET A. CLEAVES, M. D.

CHAPTER II. (*Continued.*)*The Current: Its Effects and Physiological Action.**The Cataphoric Action of the Current or Electrical Endosmose.*

—Osmosis is that physical phenomenon which causes fluids of less density to seek those of greater. If fluids of different densities are placed in two distinct compartments separated by a porous septum, an unequal mixing of the two takes place through the pores of the septum or an osmose. The level of the liquids is changed, the one of lesser density flowing in the direction of the other. The one toward the higher level is called an endosmotic current and the one toward the lower level an exosmotic current. When an electric current is passed through two different liquids separated by a porous septum, or two portions of the same liquid, some of the liquid is transported bodily through the septum almost always in the direction of the electric current, that is from the anode towards the cathode.* To this the endosmotic action of the current du Bois Raymond originally gave the name of cataphoresis.

This electric endosmose takes place independently of the ordinary osmotic action within the living organism, and since its direction varies with the current it may be said to either aid or oppose it. The phenomenon of phoresis is mixed up with electrolysis and neither the one nor the other can be considered as taking place independently. The mechanical action of the current as illustrated in the classic mercury experiment, is undoubtedly due to the cataphoric action, that is, the ability of the current by reason of this property to transport not only fluids but substances as well from the anode to the cathode. In the mercury experiment the phenomena is that of a mixed electrolysis and phoresis but with *cataphoresis*, or the moving power of the current, the striking feature.

Take a glass tube † bent at the two ends, 50 cm. in length

* Houston and Kennelly, *Electricity in Electro-Therapeutics*. Second edition, p. 361.

† Ganot's *Physics*. Thirteenth edition, p. 821.

and 1 cm. in diameter. Fill it nearly full of dilute sulphuric acid, place it in a fixed support and drop into it a globule of mercury. Into the arms of the tube introduce the two platinum tipped terminals of a continuous electromotive force. Upon establishing current flow the mercury globule elongates and moves toward the negative pole. With an electromotive force of 35 volts a long column of mercury can be moved through a tube a meter in length. With a greater pressure, 75 volts, the mercury is divided into minute globules, all of which move toward the cathode and with greater velocity. Upon reversal of the current the mercury is first stationary and is then moved in the opposite direction. Upon inclining the tube gently towards the anode, against gravity, the mercury is still moved with the current. The satisfactory demonstration of this feature of the phenomenon is dependent upon the establishment of a precise relation between the electromotive force and the resistance.

This experiment also demonstrates very clearly the electrolysis of a good fluid electrolyte, as is shown by the steady stream of hydrogen and oxygen gas bubbles to and towards the cathode and anode respectively, and also by the change in form and appearance of the one or the other end of the globule of mercury according to the polarity. This is evidently an attempt, under the action of the current, to form an acid mercury couple. The experiment of Porrett also demonstrated cataphoresis. A glass vessel divided into two compartments by a porous diaphragm is filled to the same height in both compartments with water. Into the two compartments respectively are immersed two platinum electrodes, connected with a source of continuous electromotive force. Upon establishing current flow, the water becomes decomposed and a part of the liquid is carried in the direction of the current through the diaphragm from the anodic compartment to the cathodic compartment. The experiment is best made with a solution of copper sulphate, because then the disturbing influence of the disengagement of gas at the cathode is avoided.

The tissues of the body possess the physical structure which makes electrical osmose or phoresis possible. From the physical point of view, the human skin, and also the tissues generally, cell walls muscle, septa, coats of blood-vessels, sheaths of

nerves, mucous and serous membranes, etc., are to be regarded as porous diaphragms.

Under electrolysis it was pointed out that immediately salt, for example, was dissolved in water, the condition of the solution was one of ionization and therefore it became a good electrolyte. In the human body the salts exist normally, in solution and are in a state of ionization. No electric current can flow through a non-metallic liquid such as the fluids of the body, except by the bodily movement of the ions, which requires the decomposition of the molecules. The molecule of salt, KCl, before it was placed in the water had no ions. When placed in water the K floats off with a positive charge and the Cl with a negative charge and the two are ions wandering idly about until they are brought into an electric field. At once their behavior is like that of charged pith-balls, the $+$ ion going towards the negative and the $-$ ion towards the positive end of the electric field. A feeble gradient or the release of an infinitesimal fraction of a volt of pressure to each fractional division of the electrical field, say a millivolt per cm. or even less suffices to start the procession of ions in the KCl solution. With a more powerful gradient the greater the force and speed. The ions go tumbling after one another, carrying their charges with them through the interpolar space and each ion upon its arrival at the electrode slips his charge as does a coalheaver his hod of coal down the cellar and the electric charge goes on through the current as a part of the electric current of conduction. With porous diaphragms or septa, however, such as have just been enumerated, the action is a different one. In any hole of the septum there are one or more molecules of a salt or substance that is not an electrolyte, *i. e.*, that does not crumble into ions by solution in water. Such a molecule is not an electrified ion, but is a neutral complete molecule and becomes electrified only by contact with the wall of the hole in the septum. According to the ordinary theory of contact electricity, this wall becomes positively electrified and the molecule of matter inside the wall becomes negatively electrified. The reverse might be true but nearly always the molecules of matter or salt are positive and the wall negative. Under a field of electric force, the wall tends to move towards the anode, and the molecule towards the cathode, like the artificial ions in the KCl solution. But for mechanical

reasons, the fixed wall or partition cannot move; the molecule however, goes along toward the cathode. The molecules may form part of a salt solution, moving on like ions, but they are not chemically unstable component parts of a molecule, but are permanent molecules temporarily charged by frictional contact with a foreign substance, *i. e.*, the wall. A large pressure or E. M. F., per each cm. of the electric field, is necessary in order to get a powerful gradient or rate in which that pressure changes in value. For this purpose high resistivity is necessary and this is best obtained by a small percentage of dissolved salt. (In the human body but one per cent. of the whole.) And, as has been stated, the passage of any current through the body is synonymous with the movement of ions, which involves as a rule, chemical action at the electrodes when they give up their charges. In addition there is the movement of molecules through pores. Over and above this, there is a natural or non-electric osmosis, which is akin to osmosis in gases. During an electric application all three of these actions occur simultaneously.*

By reason of these physical facts it is possible to transfer fluids and salts from one part of the body to another, depriving, for example, a transudate of its excess of fluids; an exudate or a morbid growth of their vital constituents (the inorganic salts); or in functional disturbances of nutrition, a malnutrition or a perversion of nutrition, with a lesser quantity of current, encouraging the normal ionization and osmotic action of the tissues necessary to nutrition and healthful function, according to the position and polarity of the electrode contacts.

Nor does this limit the function of the phoretic property of the current. By it chemicals in solution or suspension may be carried through the skin or mucous membranes according as to whether the chemical in question is electro positive or electro negative. The conveyance of drugs in solution, however, will be considered in a separate chapter under the heading of anaphoric and cataphoric medication.

The amount of cataphoretic transfer is governed by the following definite law. The quantity of fluid transported by cataphoresis depends upon both the nature of the liquid and the porous diaphragm, but in every case it is directly proportional

* A. E. Kennelly, Personal Communication.

to the quantity of electricity which passes. The quantity transferred in a given time is therefore proportional to the current strength.*

In the experiment upon meat previously referred to, there is a transference of the inorganic constituents, independent of the products of electrolysis; by the latter there is dissociation of the molecular constituents, and by the former a marked movement from the anode to the cathode. By his experiments Stewart has shown that not all the salts are decomposed by electrolysis, but that part are carried, unacted upon, to the cathode by cataphoresis. This according to the physics of cataphoresis, or the movement of molecules through pores. The same is true of the fluids.

The action of cataphoresis in living tissue is very beautifully shown by the phenomenon of Porrett.† When a current is conducted through the living fresh sarcous substance the contents of the muscular fiber exhibit a streaming movement from the anode to the cathode, so that the fiber swells and becomes turgescient as it were at the cathode.

For the purpose of studying cataphoresis, Stewart, whose experiments have done much to elucidate and illuminate the effects of the physical properties of the current on living tissues, studied experimentally its action: (1) on animal liquids and simple solutions of animal substances through porous septa; (2) on isolated tissues; and (3) on living animals.‡ The difficulty was to determine just how much of a given effect, was due to electrolysis and how much to cataphoresis but with animal liquid separated by a porous septum the problem was regarded as comparatively simple. These experiments showed an immense transference of water from the anode to the cathode in the case of all animal liquids and proteid solutions; a smaller proportional transference of salts, and a distinct movement of pigments and proteids.

(1) *On animal liquids and simple solutions of animal substances through porous septa.*—In an hour and a half, with a current of five milliamperes mean strength, a 3.6 per cent. hemoglobin solution diminished 40 per cent. in volume

* Houston and Kennelly, *Electricity in Electro-Therapeutics*. Second edition, p. 361.

† Landois and Sterling, *Human Physiology*, fourth edition, p. 589.

‡ *Electrolysis of Animal Tissues*. G. N. Stewart.

in the anodic compartment and increased 35 per cent. in the cathodic compartment. Again in a two hours' electrolysis of bile, with a current of 65 milliamperes, 92 per cent. of water disappeared from the anodic compartment which originally contained 10 c. c. of water. Only a small portion of this loss was due to the decomposition of the water, the greatest loss being a distinct transference of water by cataphoresis from the anode to the cathode. Similar results were obtained in liquids rich in proteids, but in them the coagulation at the anode modified the process.

(2) *On isolated tissues.*—Seventy grams of rabbit's muscle were electrolyzed for thirty minutes by a current of 350 milliamperes. As a result the water in the cathodic half was found to exceed that of the anodic half in the proportion of 48 to 31 and the salts in the proportion of 48 to 23. Here the direct decomposition of the salts was mixed up with the change in their distribution by cataphoresis.

(3) *On living animals.*—To ascertain what effect would be produced in a living animal, a hollow electrode was placed into the vagina with the idea of electrolyzing the uterus. (For anatomical reasons a rabbit newly delivered is the better subject for this experiment.) When this hollow electrode was the cathode, fluid was forced through it. This did not obtain when the intra-vaginal electrode was the anode. This is illustrated in the living subject, even when a solid electrode is used, whenever an application of the current is made to the interior of the uterus. With the cathode there is an increased secretion which does not obtain with the anode. The question arises, however, as to whether this is entirely due to the cataphoric action of the current or whether the physiological factor does not enter in, strongly influencing the result.

There is no question but that the stimulation of the living tissue by mechanical means, will result in excitation of characteristic physiological function, but no such marked phenomenon is witnessed upon passing a hollow catheter unconnected with the current, while with the current the cataphoric action is conclusively shown not only in experimental but in clinical practice.

The action of the physical effects of the current may be formulated as follows; electrolysis chemically and cataphoresis mechanically alters the amount and distribution of salts neces-

sary to the proper nutrition and function of the various parts of the living organism. By the latter there is a direct transference of the fluids and salts by way of the cell walls, muscle septa, coats of blood-vessels, sheaths of nerves, skin, serous and mucous membranes, in fact all animal membranes which from the physical point of view are all the very best kind of porous diaphragms. Primarily this action takes place throughout the tissues interposed between the electrodes (not necessarily the nearest way but along the path of best conduction), but secondarily its influence is felt beyond the intrapolar region. Just as it is impossible for a local hemorrhage to exist without its influence being felt beyond the immediate site of the hemorrhage, just so it is impossible to drain a part cataphorically, without the influence extending, even to the entire organism.

This physical effect may be carried to the extent of completely cutting off the blood supply, thereby causing immediate and actual destruction (electrolysis of a mole); or by interfering with it to such an extent that there is no channel left by which the inorganic constituents and proteid nutriment can be conveyed to the part with which to feed it and death from starvation ensues (absorption of an organized inflammatory exudate or an intramural uterine fibroid); or in lesser degree, only the normal ionization and osmotic action characteristic of living tissue and necessary to nutrition and normal function. In this latter instance the same physical effects of the current results in a stimulation of normal chemico physiological processes, *i. e.*, the movement from ion to ion throughout the interpolar circuit, the bodily transfer of complete neutral molecules and the normal non-electric osmosis. By this action nutritive changes are initiated and, by a sufficiently frequent repetition of the use of the current, are subsequently fully established. The one condition or the other will obtain according to the quantity of current and the manner of its use, that is, whether a strong or a mild current is used and whether the application is characterized by current distribution or current density. The use of a strong current of short duration, characterized by current density, has either an intense irritant or else a destructive action, while the same current if characterized by current distribution will produce an entirely different effect because by reason of the increased electrode contact (square inch area), the energy expended in each square inch of surface is diminished in proportion to that increase.

A mild current if long continued will cause a profound

change in the amount of fluids and salts in a part and in this physical fact is to be found the therapeutic indication in pathological states, whether characterized by a diminished blood supply or under nutritive activity, pelvic exudates or a beginning degeneration process, or by an excess of fluids as in a sub-acute articular rheumatism, for example.

The rationale of the Apostoli treatment for fibroids, in so far as the polar indication was concerned was based (unknowingly at the time) upon the cataphoric action of the current. The hemorrhagic action of the negative pole is in part, at least, a cataphoric effect and the value of the anode in hemorrhagic fibroids is due to the transference of the fluids and salts from the anode to and toward the cathode.

There is an actual transference of the liquids to the cathode and where the application is of such a nature as to permit demonstration, a consequent moistness and turgescence of the cathodic area is apparent. The smaller the surface of the cathode to that of the anode, the denser will be the current in its neighborhood; and as the amount of cataphoric transfer is proportional to the strength of the current and, therefore, the same through every section of the path, the effect with the small cathode in the uterus and large surface contacts, anodic, will be concentrated in the neighborhood of the former. The liquids gathered from a large contributory area will pass along an ever narrowing channel and pour themselves out as an increased uterine secretion or hemorrhage, or a condition such as a secretion or hemorrhage or simply increased blood supply according to the anatomical locality and nature of contacts. And although there unquestionably is, in an intra-uterine application for instance, an effect at the anode due to the action of the liberated acids on the mouths of the bleeding blood vessels, serving to coagulate the proteid constituents directly at the site of the internal electrode, the hæmostatic action is largely due to the removal of liquids by cataphoresis. When the application of the current is prolonged, this anodic coagula is still further dried by cataphoresis.

This coagulation or drying of the tissues is accompanied by a choking of the blood vessels at the site of the electrode, and as the way of the current is by way of the salts in solution or in a condition of ionization, most active in the blood stream, conduction is not only less good but the physical conditions of the anode became unfavorable to further cataphoric action. This can be proven by reversing the poles. At once the coagulated or anodic area becomes the cathode, the current flow is increased to the initial amount because the conditions at the new anode are again favorable to the transportation of fluids and salts. The old anode in becoming the new cathode, is once more the seat of increased blood supply although the havoc wrought by the former coagulation may have been too great

to entirely overcome. By this reversed action of the current the change in physical effects is of such a nature as to produce a change in physiological action and a much more profound stimulating effect is produced than when the current is permitted to flow in one direction.

If the application is made within the tissues by means of a needle or by means of a metal contact of the nature of a sound within an accessible mucous cavity, electrolysis even with a weak current, if long continued, will still further dry the anodic coagulum by electrolysis. To this process a share in the physical effects at the anode or positive pole may be attributed.

In this physical fact can be found the best of reasons for a prolonged application with a mild current for the control of a uterine hemorrhage, due to an intra-mural fibroid, a fungoid endometritis or in a vascular tumor. It is not necessary, as will be shown in a subsequent chapter, to always resort to intra-uterine applications for the control of a uterine hemorrhage. Because of the cataphoric property of the current, the characteristic drying at the anode can be secured by the use of large surface contacts, either with well wetted electrodes of large square inch area in percutaneous applications or by filling cavities with water in mucous membrane contacts, as for example, the stomach, bladder, or vagina.

In accordance with the physical law governing cataphoresis, the thickness and area of a porous diaphragm have no effect upon the amount of liquid transported provided the current strength is constant; but a thick septum or diaphragm of small active surface adds greater resistance to a circuit, than a thin diaphragm of large active surface and will therefore tend to restrict the current strength and in consequence the amount of liquid transferred.

The nutrition and healthful function of the living organism as a whole, as well as a part, is absolutely dependent upon the maintenance of the normal proportion of fluids and salts. It follows, therefore, that if deprived of these, as for example, in cholera, there results deficient nutritive activity and vitality leading often to death. The same is true of exhaustive hemorrhages and hence the value of intravenous or cellular transfusion of quantities of a normal saline solution in these conditions. It follows, therefore, that the removal of the fluids and salts from a part, a fibroid for example, by the action of the current, even though the removal be but temporary, will tend to the death of the tissue thus acted upon.

Morbid growths and all suborganized material are less well provided with blood vessels than normal tissue and such an action will tend to interfere with the circulation, with the result of depriving the part of its proteid nutriment, or in other words starving the growth or exudate.

Editorial.

ELECTRICAL THERAPEUTICS VERSUS SUGGESTION.

WHEN it is so often implied by neurologists that electricity especially the high volt static currents act only as suggestive therapeutic measures it is evidence of deficient training or experience in their scientific employment.

Recent writers of books upon nervous diseases who have shown remarkable evidence of research and application to histology and pathology have, if they are to be followed in their methods of treatment, blocked progress and thrown a pall over suffering humanity, and those who follow their dictum and invariably treat with arsenic, argentum, the bromides, iodides, mercury, and a host of other sometimes useful remedies, but as a rule futile, and ignore the physical agents, will not succeed as those who do otherwise.

The employment of such measures in the treatment of sciatica (a disease which in the first week may be invariably cured in a few days by the static modalities) by one authority is a remarkable exhibition of want of appreciation of a great truth.

Those who are familiar with the scientific administration of the high potential currents of the static machine and other high-frequency apparatus are conscious of the power of such currents to overcome local stasis, to improve local metabolism and thereby relieve and cure local congestion.

Any agency which is easily demonstrated to favorably affect inflammatory processes cannot be looked upon as a suggestive therapeutic measure. How often has the statement been made that static electricity is only suggestive. That it is suggestive there is no doubt, but that it is only suggestive is as far from truth as that sciatica or rheumatoid arthritis can be cured by suggestion.

No agent employed by the profession is so certain in its action for the relief of acute and chronic inflammatory processes as the high potential electrical modalities and none more harmless. In every special department of medicine and surgery, they will do valuable service.

In addition to the effect upon inflammatory conditions it is doubtful if a more potent agent exists in its favorable influ-

ences upon general metabolism than the electric currents which penetrate every tissue of the body and induce general activity of the body functions.

The certain and effective action of these modalities is demonstrated in the heat production, by which a patient during administration is rendered warm in a cool room, or uncomfortable on a warm day; as well as by the increased elimination of CO₂ and solids in the urine.

* * *

REPORT OF THE COMMITTEE ON CURRENT CLASSIFICATION AND NOMENCLATURE.

THE work of the above special committee of the American Electro-Therapeutic Association is occasion for congratulation. At last a scientific nomenclature of medical electricity is to be established which will be in accord with that adopted by the Society of Electrical Engineers. The personnel of the committee and the brilliant work already accomplished by them, is reassuring.

It may be difficult for many physicians to abandon terms like "galvanism" and "faradism," which seem fixed like hills upon the landscape, but when the distinctive expressions "continuous" and "induced" are recognized as descriptive of the characteristics of the currents they will be accepted.

The great value of the work of this committee will not be fully appreciated until completed. Their earnest investigation of the characteristics of the static and other high frequency and high potential currents will lead to a more precise and accurate recognition of their physical qualities and consequent determination of the influences of the currents upon the tissues.

The work accomplished so far in the accurate measurement of static currents is evidence that instruments of precision will soon be produced for measurement of such currents as produce the X-ray, which will lead to a consideration of the quality of the rays regardless of their source.

The first installment of the report of the committee, which comprises about fifty pages, appears in this issue and will be continued monthly until completed.

Change in the Journal of Electrolgy.—Hereafter this Journal, with which is incorporated the Journal of Physical Therapeutics, will be published monthly instead of quarterly and its readers will be kept *au courant* with the best and newest in the field to which the publication is devoted.

It is edited by Dr. W. S. Hedley of London and Dr. Margaret A. Cleaves of New York. The character of work done in the past by the able editors is an assurance that the journal has won the appreciation of the constantly increasing number of physicians who are becoming interested in these subjects. The subscription per annum will hereafter be \$3.00. Subscriptions for America should be addressed to Dr. Margaret A. Cleaves, 79 Madison Ave., N. Y. City.

Progress in Physical Therapeutics.

PHOTOTHERAPY.

BY MARGARET A. CLEAVES, M. D., NEW YORK CITY.

Ultra-Violet Ray. Burns of the Eye.

Dr. A. W. Colcord, of Clairton, Penn., reports the following occurrence:

An arc, 250 volts pressure, used to melt a hole through a pig iron plate, gave a current of 1500 amperes. The positive pole was grounded on the iron plate and the negative was connected to a carbon two inches in diameter and two feet long, attached to a sixteen-foot wooden handle.

With this a six-inch hole was melted through a three-foot iron plate in eight hours. During this time three of the operators received severe burns of the eyes. As they stood from ten to fifteen feet away from the arc, where the heat was not so great, it is believed that the burns were produced by the ultra-violet rays of the arc light.

Case I.—Six hours after exposure had dimness of vision. In another hour there was swelling of eyelids, puffing and congestion of conjunctivæ, marked photophobia, and lachrymation, with great pain in eyeballs and burning of conjunctivæ. The symptoms increased in severity for two or three hours, gradually subsiding in twenty-four hours, all save the dimness of vision which persisted for two weeks. During that time he was unable to read ordinary print, or to recognize a friend across the street. As he did not return for treatment during that time, Colcord was unable to make an examination of the retina, but believed that the dimness of vision was due to retinitis. There was also in this case a burn of first degree of entire face, with peeling of epidermis on the day after as in sunburn.

Case II.—Same general symptoms as in No. I, but more pain, requiring three-quarter grain morphine hypodermically. There was some dimness of vision in this case, subsiding in a day or two.

Case III.—This case was similar to others, though recovering completely in two days.

The treatment adopted in all cases was rest in bed in a darkened room. A two per cent. solution of cocain was used, but failed to afford much relief from pain and burning. In all of the cases an ointment of bichloride of mercury (one gr. to five ounces of sterilized vaseline) was put into the eye, but proved very irritating and was discarded. This ointment had been successfully used for some time in all ordinary burns of the conjunctivæ or cornea. The greatest relief in the cases recorded was obtained from applications of cold sweet cream

from cows' milk and from cold compresses of boric acid solution.

Colcord in his summary calls attention to the following peculiar features of these cases:

(1) The extremely high candle power of this arc light, estimated by their electrician at 480,000, or three hundred times as strong as an ordinary street lamp.

(2) Length of time elapsing from exposure till effects of burn are felt, longer than an ordinary burn, shorter than an X-ray burn.

(3) Pain and burning out of all proportion to visible signs of inflammation.

(4) Failure of the remedies used in an ordinary burn of the eye.

(5) Tendency to rapid and complete recovery without scarring or other permanent effects.

From the fact that glass is not transparent to ultra-violet rays, Colcord recommends that those working with similar apparatus should wear large thick spectacles of red glass.—*American Electro-Therapeutic and X-ray Era*, Nov., 1903.

Remark. In view of the therapeutic uses of powerful electric arcs and of the chemical activity of the ultra-violet rays, the cases of Colcord are of the greatest interest. Lavrand* reported the case of an engineer who remained exposed for about an hour at a distance of about three feet to the rays given out by two fifteen ampere connected arcs. He stood in the cone of the rays where the light was least but the chemical activity greatest. Three hours afterwards he felt a tingling in his eyes and soon presented all the symptoms of sunstroke, lachrymation, redness of the skin of the face and tingling, and then very severe supra-orbital neuralgia. The distance from the source of light in this case was from one-third to one-fifth of that of Colcord's cases, the current one five-hundredth as much; the time of exposure but one-sixth as much and the time of development of symptoms one-half of that of Colcord's cases. There was only slight action in the eye as compared with the cases revealed, and the symptoms were more those of an electric sunstroke.

The same cause operated in both instances, and care should be taken in prolonged using of the electric arc not to subject the eyes and head to its intense chemical activity without suitable protection.—THE EDITOR.

Radium.

Exner reports nine cases of cancer in which radium has effected very considerable lessening of the swelling and in two of these cases the swelling has not reappeared, although five months have elapsed since the treatment. In one inoper-

* *Journal de Sciences Médicales*, Lille, May 2, 1898.

able case of cancer of the palate, considerable improvement was effected by the use of radium, the swelling having been reduced to a minimum. Where operation is possible, Exner believes it to be the preferable course, but advises the use of radium in inoperable cases.—London Elec., Nov. 6, 1903.

RADIOGRAPHY.

EDITED BY HERMAN GRAD, M. D.

Relation of Orthopedics and Radiography. By Byron C. Leavitt, M. D., Denver, Colo., Denver Med. Times.

To attempt to make an accurate diagnosis in a large per cent. of orthopedic cases without X-rays is as impossible as to diagnose accurately kidney disease without the microscope. To rely entirely upon X-rays is as impracticable as to attempt to tell from the microscope the general condition of a patient suffering with disease of the kidney. Both are complementary. Orthopedics is especially related to X-rays because of so much of its sphere having to do with disease of bones, and this is what X-rays most prominently reveal.

In orthopedic work the X-rays is upon a positive and scientific basis. If its therapeutic value diminishes in the future, it is sure to be much more generally used in orthopedics than it is now. This is because its great aid to diagnosis is already firmly established.

It has already been largely instrumental in the discarding of the term "chronic rheumatism," and the proving that this so-called disease has no existence whatever, that a diagnosis of "chronic rheumatism" means "I do not know what the trouble is and give it this name." The tissues are debilitated from numerous causes having nothing to do with rheumatism, as is positively proved by the X-ray, consequently the salicylates are highly injurious instead of beneficial, because they derange the stomach and weaken the tissues instead of strengthening them, when the latter is what is required.

The ankle is swollen and painful, because of a breaking down of the arch of the foot, as shown by the position of the bones, or in many cases the weight-bearing line of the foot is brought outside of its normal position, and causes severe pain in both ankle and knee. The fluoroscope may show a floating cartilage with bony deposit, in the knee-joint, which causes all the swelling and pain, or when there is no hardened condition of the floating cartilage this may be felt or told because of the sudden and severe pain upon motion of the joint.

Again, a patient comes for examination, giving a history of swelling and extreme pain, of some weeks' duration, in one or more joints. There is inability to move the joint in any direction. X-ray shows the condition of the bones to be normal.

The swelling and tenderness probably came on suddenly, possibly inside of six or eight hours. Instead of being classed as rheumatism, and valuable time worse than wasted in treating it as such, it should be recognized that this condition is due to some septic process, having no association with rheumatism. There will be found to have been some septic process elsewhere, as typhoid fever, some septic condition following childbirth, an abscess, diphtheria, or tonsillitis. A history of gonorrhea, accompanied with this kind of a joint, means that there should be an opening made at once and the gonococci killed by water heated to 120 degrees, which destroys the germs, but not the tissues. Many a stiff leg, with the patella permanently glued down and inoperable after four to six weeks from the time the swelling commenced, would be avoided, if this operation had been done with a gonorrheal knee, instead of calling it gonorrheal rheumatism and treating with salicylates or local applications, allowing the valuable time to elapse when the gonococci could have been destroyed before an incurable stiffness had resulted.

To treat this condition with X-rays therapeutically would be as inexcusable as to give salicylates internally, but to use the rays to demonstrate that the bones are not involved might prove of great help if the patient comes for consultation when the disease has been present several weeks, at a time when he cannot bear motion or pressure.

In the region of the hip, radiography is of special value. Last year I saw a patient who had been unable to move the femur of one leg for over fifteen years. He had consulted the most eminent medical authorities in this country and Europe. The diagnosis of tuberculosis had been constantly made. He suffered intense pain upon the least motion, which he could only partially relieve by tension from weights attached in the way this is done in acute tubercular hips. He was obliged to remain in bed most of the time, in order to keep on the weights, and was gradually losing weight from this unhealthy mode of living, as well as undergoing constant pain. A radiograph was taken. The head of the femur was plainly seen to be imbedded firmly in the acetabulum, showing a typical case of osteoarthritis, instead of any tubercular disease. This meant that the cotyloid ligament had become bony, that it would never allow any motion of the femur, weights being useless, and that the only treatment was cutting down upon the femur, chiseling out the imbedded head and supporting the patient with a hip splint in walking. This was done. The patient was relieved of his pain, gained his normal weight and walked with one cane with less difficulty than he had previously done with two crutches. Whether he will be permanently cured I do not know as I was not East long enough after he was operated upon to follow up his case; but if he could have had the benefit of radiography

five years after the commencement of the disease instead of fifteen years, cure would in all probability have been permanent, and may be even in this case.

To attempt to diagnose without the X-ray different conditions of coxa vara, whether traumatic, due to overstrain, or to inherited delicacy of structure, is, to use the words at the commencement of this paper, as inaccurate as to diagnose kidney disease without the microscope.

The great advantage of radiography in congenital hip disease has been so fully well upon and illustrated since the visit to this country of Dr. Lorenz that it is hardly necessary to mention the well-known fact that X-rays are of the greatest value in making the diagnosis, and in watching the progress of the treatment.

HYDROTHERAPY.

EDITED BY CURRAN POPE, M. D.

A Brief Outline of Hydrotherapy. Modern Medicine, June, 1903. By J. H. Kellogg, M. D.

Historically, hydrotherapy is the oldest of all curative measures devised and applied by man, but practically it is one of the newest to be recognized by scientific medicine.

Priessnitz was not a charlatan. His work was subjected to the sharpest medical criticism by medical commissions appointed by various governments. Many medical men, including army officers, carefully studied his methods and openly published their approval of them. After years of opposition, he was finally recognized and officially authorized to conduct his work, which to-day is standing a monument to his genius, and is conducted by a worthy successor, a well-qualified and scientific medical man.

The basis of hydrotherapy, indeed of physiologic therapeutics in general, is the great truth expressed by Dietl, the renowned pupil of that great medical genius, Rokitansky: "Nature heals; this is the first law of therapeutics. Nature creates and maintains, therefore she must have power to heal." In other words, "it is the blood that heals." Hence we must look for definite and positive curative results to those agents which are most capable of favorably modifying the quality of the blood, and controlling its distribution in the body.

Hydrotherapy is termed a natural or physiological method, because it employs natural agents or forces and those which are constantly serving us in the maintenance of health. The sick man differs from the well man only in the fact that his organism is struggling under embarrassment. The natural bodily defenses are unable to maintain normal equilibrium. Hydrotherapy comes in with its powerful thermic impressions to reinforce and strengthen these defensive efforts, thus en-

abling the body to restore the normal equilibrium, which is health. In accomplishing this, a large number of hydropathic procedures act through impressions upon the temperature nerve of the skin, by far the most sensitive and most remarkable of the cutaneous nerves. Cold applications stimulate the cold nerves, and hot applications the hot nerves. Each of these sets of nerves has its own widespread network of reflex relations with nerve centers and through them with the internal parts and functions of the body. Nothing will so quickly rouse a patient from the profound and deadly stupor of opium or other narcotic poisoning, as very hot and very cold applications made to the spine in alternation at intervals of fifteen or twenty seconds. There are no means by which the patient suffering from surgical shock or collapse under anæsthesia, can be so much and so quickly rallied as by this means, combined with very hot or very cold friction of the limbs.

Samuels has shown, by experiments upon rabbits, that cold applications lessen the intensity of inflammatory action. Heat intensifies the process but shortens it, as everyone knows who has watched the effect of a poultice or of other hot applications upon a boil.

Strasser has shown that cold applications increase the alkalinity of the blood. This increases the oxidizing power of the blood and its defensive activity, the bactericidal properties of the serum, and the migratory and phagocytic functions of the white cells may increase thirty per cent. Modern researches show that leucocytosis is one of the means by which nature combats infections and many other impairments of the functional integrity of the body. Here then is a ready means by which to rally the defensive power of the body and to aid nature in her struggle against invasion of the vital domain.

It is to this influence of cold that sea bathing owes its great virtue as a recuperative measure, rather than to the saline ingredients of the water, or any mysterious virtue in the odor of decomposing seaweed.

In tubal or ovarian inflammation, we apply one or two ice-bags over the inflamed part, which reflexly contracts the vessels of the inflamed tissues. At the same time we envelop the patient's hips and legs in a woollen blanket wrung out of water as hot as she can bear, wrapping her completely up in a dry woollen blanket so as to secure derivative action toward the skin. At the end of fifteen minutes, or when the skin is well reddened, the wet blanket is removed, the ice-bag remaining, and two towels are wrung dry out of cold water and applied, one about each leg, enveloping the limb as completely as possible. The ice-bag is replaced every hour for ten or fifteen minutes by a very hot fomentation. This is necessary to prevent numbing of the

skin, which destroys the reflex effect whereby the inflamed vessels are made to contract.

Appendicitis, as well as all forms of acute pelvic inflammation, readily yields to this procedure in ninety-five per cent. of the cases in which it is applied early, or within the first twenty-four hours.

In the treatment of chronic disease, hydrotherapy is indispensable. In recent works on practice one finds acknowledgment of this fact on almost every page treating of therapeutics. "If the foregoing remedies fail," as they often do, "resort to hydrotherapy," is the expression constantly reiterated by such authorities as Osler, Anders, and other men of equal professional standing.

All curable forms of autointoxication naturally yield most readily to hydiatic measures in combination with other physiologic means. The sallow, inactive skin which is characteristic of this condition is powerfully stimulated to activity by the electric-light bath and sweating baths of all sorts, followed by short cold applications. The sweating pack followed by the cold wet-sheet rub, fomentations over the abdomen.

In pulmonary tuberculosis hydrotherapy will diminish fever, cough, night sweats, and pain, and will increase appetite and strength, cause a gain in flesh and blood, and so increase the bactericidal property of the blood as to bring about the destruction of the invading bacteria and complete restoration to health. The hydiatic method, coupled with an out-of-door life and proper feeding, will cure nearly every case of pulmonary tuberculosis if the case is taken in hand early enough.

Hot baths burn up uric acid, and cold baths improve metabolism, so preventing the excessive formation of purin wastes.

In short, experience justifies me in saying that scientific hydrotherapy may be relied upon to increase vital resistance, the elimination of toxins, the destruction of poisons, the destruction and elimination of bacteria, leucocytosis, and oxidation, to excite nerve centers, to promote normal metabolism, to encourage blood formation, to regulate blood movement, to increase heat production when needed, as in collapse, and to increase heat elimination, as in fever.

These means may be equally relied upon to decrease heat production in fever, to diminish heat elimination when necessary, to prevent bacterial growth, to relieve stasis of the circulation, to diminish metabolism when excessive, and to lessen nervous irritation.

PSYCHO-THERAPY.

EDITED BY LESLIE MEACHAM, M. D.

The aim of the editor will be to give such information upon the use of suggestion in therapy as lies in his power. Special

attention will be given to its employment as an adjuvant to other measures, either medicinal or physical, since few who require suggestive treatment can best be treated by that agent alone. Self-estimated experts in psycho-therapy have been too often so ignorant of physiology, pathology, and general therapy, that they did not appreciate the limitations of the treatment that they advocated and have thereby so intensified the prejudices against their methods that the self-respecting physician could not endorse them. The lack of clinics in suggestive therapy has made it difficult for physicians to gain definite information upon obscure points, and to judge what cases are suitable for such treatment.

This department will endeavor to supply this need.

A description of hypnosis employed by Prof. J. J. Putnam, of Harvard, in the Shattuck annual address to the Massachusetts State Medical Society a few years ago, may well be used as a peg upon which to hang many facts. He said: "Hypnosis is allowing the critical faculties to stand aside." This statement requires some consideration and, possibly, some knowledge of the subject for complete comprehension, but it does describe the process of producing hypnosis, and gives a key to the methods to be employed and to the class of people most easily affected by suggestion.

A perplexing problem always has been to describe the characteristics of people easily hypnotized. One writer will insist that the feeble-minded respond best, another the ignorant, a third the hysterical, while a fourth will maintain that it is the most highly cultured. A careful clinical observation will convince an impartial observer that these are but incidental conditions, and that the essential qualification is the ability to accept a suggestion without analyzing or criticising it. If this is done by a person capable of keeping his attention upon the suggestion he may be affected to a degree regulated by his intellectual capacity, and in many tests by his imagination. He may naturally be lacking in analytical power, or capable of "allowing them" to stand aside, the result is the same. The individual whose attention has been trained and the one accustomed to discipline will naturally be more responsive than those who have run wild and in whom self-control is an absent quality. This principle accounts for the suggestibility sometimes noted of soldiers, and well-trained children and servants. Similarly confidence in the suggester becomes an important factor. If the patient entertains any doubts or suspicions, he studies the suggestion, may accept it in part or not at all, and receive little or no impression. For a similar reason, the person who is much interested in the science of suggestion is affected with difficulty, as his mind is actively engaged in considering the methods employed rather than in accepting the suggestions.

While we cannot absolutely demonstrate the cerebral localization of the intellectual functions, and prove that each branch of learning has its own peculiar cluster of neurons, its assumption as a working hypothesis is certainly allowable. Judgment is dependent upon comparison, and we may assume upon the integrity and activity of the association tracts which make comparison possible. Inhibition of such activity decreases the power of synthesis without necessarily affecting analysis. It permits deductive, but diminishes or prohibits inductive reasoning, the degree of prohibition depending upon the amount of inhibition. All the phenomena dependent upon intellectual activity in sleep, delirium, or hypnosis, point to localization of intellectual faculties and a diminished activity of the association tracts, so that while the mind may be keenly active along certain lines, and the imagination capable of the wildest flights, the power of checking or regulating this activity by the fruits of experience, the power of exercising judgment is diminished or lost.

The contrast of the activity of the association tracts determines the line between the visionary and the practical man and accounts for the fact that most men of genius are notoriously impractical.

Thus the person of good native capacity acting under hypnotic suggestion, when the activity of a certain brain area is aroused, is capable of employing its store of concepts to a degree not possible to him in a normal state, since there is no divergence of thought, no intrusion of extraneous ideas. There is also no power to turn the activity into other channels. The same principle emphasizes the importance of hypnotic suggestion in therapy.

It is such concentration of mental energy that affords the highest examples of intellectual activity, and upon the ability to allow the association tracts to resume activity, upon the ability to permit judgment to study and correct the results of such labor, depends its value. Such power of inhibiting and stimulating the activity of the association tracts determine the difference between the great inventor and the troublesome crank, between a Herbert Spencer and an Emanuel Swedenborg. The epoch makers in literature and science have been able to allow their imaginations to run riot and then to exercise the critical faculty, carefully prune the product, rejecting the illogical and the unproven.

A considerable proportion of the patients coming to all physicians, suffer from misdirected mental activity. They may be by nature deficient in reasoning, or through nervous exhaustion have a decreased power of using it. The attention may have been fixed upon some slightly abnormal mental or physical process, even a wholly physiological one, and the imagination "runs riot" with a resulting functional disorder, or a psychosis. Owing to the intimate connection existing be-

tween the emotions and the sympathetic system, the nutrition may be affected, and the condition intensified. The physical disturbance may be, so far as we are able to determine, dependent wholly upon the psychical disturbance.

The restoration to health depends upon the establishing of a proper physical or psychical balance, or both. Some such cases can be best cured by physical agents, some by metaphysical agents. The most logical course certainly is to employ both.

An important question is: How best to use psychic agents? With many patients the repeated positive assurances of the intelligent physician, well backed up by proper therapeutic measures will secure satisfactory results. With others systematic training of the mental faculties is essential. In such cases it is necessary to train the attention before any lasting impression can be made. Here lies the widest field for systematic suggestive therapy. There may be much mental activity of an undirected nature. The first step is necessarily to diminish that activity, to induce a passive condition of the mind in which the attention is given chiefly or wholly to what is being said by the physician. This having been done it is possible to make a strong impression when otherwise either a weak one or none at all would be made.

Treatment by suggestion is strictly educational work. It is just as much training of sub-conscious mental activity as the teaching of the multiplication table or any other form of learning which is made automatic. That irregular sub-conscious activity which produces or perpetuates a "memory" or "hysterical" pain can be arrested. Every function of the body under the control of the sympathetic system can be regulated. The production of hypnosis in any degree is simply preparing the soil for the seed of suggestion.

LARYNGOLOGY, RHINOLOGY, AND OTOLOGY.

EDITED BY W. SCHEPPEGRELL, A. M., M. D.

Serum Treatment of Hay-Fever.

A series of experiments which tend to demonstrate that the serum treatment may eventually become as valuable in hay-fever as it is now in diphtheria, is reported by Dr. Dunbar, Director of the Hygienic Institute at Hamburg (*Deutsche Med. Woch.*, 1903, XXIX, p. 149; and *Minchener Med. Woch.*, 1903, No. 23), and is of great interest. He seems to successfully show (*Jour. of Eye, Ear and Throat Diseases*) that the pollen of a great variety of cereals and grasses—rye, oats, wheat, corn, grasses—contain substances that in susceptible individuals, but only in the susceptible, produce the well-known phenomena of hay-fever. And these pollens produce hay-fever,

no matter how or where or when introduced. The active substance is soluble in tears, saliva, nasal secretion and blood serum. The toxin which causes it is a soluble starch grain in the heart of the pollen of grains and grasses. The author was able to induce a typical attack of hay-fever with asthma by subcutaneous injection of this toxin, in winter. 'Apparently the pollen toxin in the different grasses is the same because one pollen may be neutralized by the antitoxin obtained from the injections of pollen of a different source. Dunbar undertook the production of a curative serum by following the principles of immunization. Animals were injected with pollen toxin, and after prolonged injections an antitoxin developed in the serum. This not only rendered pollen harmless when mixed with it in the test tube, but it also neutralized the effects of the pollen when introduced into the eye or nose shortly after the local application of the pollen. When injected it protects susceptible subjects against infection with the pollen toxin, and there is every reason to suppose that it will protect against actual hay-fever. The serum is perfectly harmless, but he does not give it to anyone but physicians.

In an article on the same subject in which reference is made to the experiments of Prof. Dunbar, Sir Felix Semon, of London, reports the result of his experiments with the serum, and offers the following conclusions (*Annals of Otol., Rhin. and Laryng.*, June, 1903).

There can be no doubt that Professor Dunbar has succeeded in extracting from the pollen of certain grasses (maize, wheat, rye, *anthoxanthum odoratum*, *agropyrum repens*, *cynosurus*, etc.), a toxin which when instilled into the eyes or nostrils of people predisposed to hay-fever, produces in these parts the characteristic subjective and objective symptoms of the disease.

The toxin, when injected into the eyes or nostrils of people not predisposed, produced, in the great majority of cases, no symptoms whatsoever, but it certainly appears from Dr. T.'s and my own experiences as if there were instances of transition in which, although the persons experimented upon never suffer from typical hay-fever, they are yet more susceptible to the influence of the toxin than the ordinary run of people.

The effects of the toxin in the people suffering from hay-fever are as variable in intensity as are the attacks of the affection itself, both with regard to the local and the constitutional symptoms.

Professor Dunbar's antitoxin certainly produces immediate disappearance of the subjective, and after a few minutes great amelioration of the objective symptoms.

The mixture in equal parts of a toxic solution (1 in 500) and the antitoxin serum suffices to neutralize the specific effects of the toxin.

The effects of the antitoxin appear in some instances to be

sufficient to prevent a reappearance of the subjective symptoms, whilst in other instances repeated instillations of the antitoxin were required to produce ultimately the return to normal conditions.

We do not know yet what the nature of the special predisposition is which makes one person react violently to the influence of both the natural pollen and of the artificially-produced toxin, whilst it leaves another quite unaffected. Whilst it may be justly hoped that it will be possible to produce an even more effective serum no guarantee can at present be given, nor do we know for certain whether it will be possible to produce such antitoxin in sufficient quantities to use it extensively. It may, however, confidently be hoped that such will be the case. Whilst the antitoxin serum as at present produced quickly neutralizes the local effects of the toxin, it is impossible to foretell whether in cases of genuine attacks of hay-fever, an even more powerful serum than that at present prepared, applied by way of instillation into the affected mucous membranes, or by subcutaneous injection or by internal administration, will arrest all the symptoms when once fully established, and even if it should do so, whether the effect will be lasting, or whether the symptoms may not return. Finally, it is equally impossible to foretell whether by the prophylactic application of a very powerful serum we shall succeed in altogether preventing the actual outbreak of an attack in those specially predisposed.

SOCIETY MEETINGS.

AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION. THIRTEENTH ANNUAL MEETING.

Held in Atlantic City, N. J., September 22, 23, and 24, 1903.
Daniel R. Brower, M. D., Chicago, President.

(Continued.)

Dr. W. J. Herdman presented the report of the Committee on Constant Current Generators and Controllers.

It has now been nine years since this, together with certain other of our standing committees, was created.

At that time (1894) we who were making use of electricity for therapeutic purposes felt that we knew far too little of the nature of the agent that we were employing. We recognized that in its several modalities then known to us that its physiological and therapeutic effects differed largely. The devices and apparatus designed to furnish these electric modalities both for therapeutic and industrial purposes were as various in form and construction as they could well be made by the designers and makers who brought them forth. Even those devised with the intent of furnishing the same kind of modality were oftentimes of very different construction and the current they fur-

nished gave very different results as to nature, degree, and constancy of E. M. F., volume of current, durability, etc.

Marvelous has been the increase and variety of new electrical machinery which has sprung into existence during that nine years and if there was need at the beginning of a standing committee charged with the duty of separating the wheat from the chaff—of examining, testing, and observing, during the course of each year what the harvest of inventive genius has produced, and making known to the busy worker in the electro-therapeutic field what was most suitable for his purposes and what was not, there is now far greater need since not only are the forms of new apparatus so many and various, but the number of workers needing such knowledge has so greatly multiplied.

In no other way has this Association done so much for the development of a sound and rational practice of electro-therapeutics as by the good work that it has accomplished through the conscientious labors of its standing committees and the several special committees which have from time to time been created on the various forms of electric action and apparatus.

I would make special mention in this connection of the work already done and still in progress by the Committee appointed in 1901 upon "Current Classification and Nomenclature." The work assigned to that committee is so vital to the progress of exactness in electro-therapeutics and the members composing it, are so eminently well fitted to do permanently, and to the satisfaction of all concerned, the task they have undertaken that we cannot but congratulate ourselves and the science we seek to advance that we are soon to have a nomenclature adequate to our needs and one which will be worthy of universal acceptance—ridding our literature of the confusion, indefiniteness, and provincial crudeness which has hitherto characterized it. A science is prepared to make rapid advances only when its nomenclature has reached a stage where all workers for, and contributors to, its progress, in whatever direction their researches tend, can make themselves clearly understood. All who attempt to express themselves as to electrical phenomena must have a language which permits of no misconceptions of each other's meaning.

It will be seen from the work of that committee that the form of electric modality the "Constant Current"—on the generators and controllers of which it is the special duty of my committee to keep tab—is something which in electro-therapeutic practice is seldom realized. It will be seen from the definition which the Committee on Nomenclature has given us that a "Constant Current is a continuous, unidirectional current, the strength of which remains unchanged."

But in electro-therapeutic practice there is usually one variable term in the formula through the influence of which the strength of this current changes, that is the resistance. No matter what our source of current, this factor introduces a

variable which must be accounted for in all attempts at exact work. But there need be no unnecessary number of such variable factors and our object should be to reduce them to a minimum and secure from our apparatus the greatest possible uniformity in action. It is only by a knowledge of these characteristics of the current we are using and by a study of the physiological and therapeutic correspondences or relationships with them that we can make the results of our work accurate and comparable.

It has been the purpose of this Committee on the Constant Current from the beginning of its labors to seek out the best and simplest and at the same time the most practical forms of electro-therapeutic appliances for generating and controlling this form of modality when it is required or indicated. We found in the early days of our investigations that the chemical source for the direct current—some form of primary wet cell, coupled in series of a few or many—was that mostly depended upon by electro-therapeutic workers. Excellent results have come from currents derived from this source in the past and are still obtained by those who have the skill, knowledge, patience, and perseverance to use them. He who can keep in efficient service a long series of corroding cells with fluid electrolyte, has the spirit and preparation for a successful practitioner of electro-therapeutics, and usually is one. But our busy modern practitioner is impatient of the delays and annoyances of imperfect apparatus in his efforts to attain the end sought. The direct-current dynamo and the dry-cell battery soon offered a source of direct current much more attractive to the operator and freed the practice from many of the delays and annoyances which accompanied it in the use of the wet cell. As to whether the electrolytic, phoretic, physiological, and therapeutic effects produced by direct currents derived from dynamo circuits differ, in any essential particulars, from those obtained from currents of equal or corresponding measurements when the wet or dry cell is used as a source for this generation, is still an unsettled question. A member of this committee who has had many years' experience in the electrolysis of urethral strictures has the charity to believe that the failure of certain of his critics and detractors, who have failed to obtain results similar to his own in the treatment of urethral stricture by the use of cathodal electrolysis, may be due to the differences in the nature of the current, as obtained from the dynamo circuit and controlled by a rheostat, when compared to the increase or decrease of the number of chemical cells in the circuit which he uses. We are not prepared to say that this may or may not account in a measure for the difference in results as claimed but it is a minor factor in the explanation of this difference of results as compared with many others which might be cited.

The apprehension that was at first expressed both in the meetings of this society and elsewhere, as to the danger attending the use of dynamo circuits in electro-therapeutics has

proved unfounded. Daily use is now being made, all over the world, of the industrial circuits by physicians as a source of direct current for therapeutic uses. The initial E. M. F. ranges in different cases from 500 to 110. In some instances it is maintained as a direct current in the mains and in others it is transformed from an alternating system by some form of converter. Very readily and conveniently by means of suitable shunts these sources of current can be brought within the range of electro-therapeutic needs, and are now quite generally serving the practitioners of electro-therapeutics wherever they are available, as has been shown in several of the previous annual reports of this committee.

But there are two conditions under which the dynamo source of current cannot meet the need:

1. Where no such circuit is available, and
2. In portable work, where the current must seek the patient,—the patient being unable to come to the office or hospital.

There is a large per cent. of electro-therapeutic work for the direct current where these conditions obtain.

It is true we still have the portable direct current (or galvanic) battery, with its 10, 20, or 30 cells containing fluid electrolyte, usually a solution of chromic acid or of potassium bichromate solution with zinc and carbon elements. But few of us there are now who have either the time or patience to give the care and attention to a battery of this form such as is required to keep it in working order. A construction that would keep the corroding fluid within bounds, confine its action to the time when it was needed, be sufficiently powerful and still be compact enough to be conveniently carried about, has been a problem difficult of solution.

The dry cell has solved many of these difficulties, very happily. It has been made small enough by many different manufacturers so that a sufficient number of cells can be packed in small space, and yet furnish from 20 to 50 volts—a pressure ample to meet the requirements of the greater amount of electro-therapeutic work for which the constant current is needed. The remaining requirements are constancy in action and durability. In these particulars it has been found that the efficiency of the various forms of dry cells upon the market, for electro-therapeutic purposes, differ largely.

It will be recalled that the demand made upon these cells when employed for electro-therapeutic work differs from that of almost all other uses to which they are put. A current averaging from 10 to 30 Ma. is drawn from them, for perhaps two hours each day, in the physician's practice. And the two hours of action is not likely to be a continuous period but made up of 15 or 20 minute periods with intervals of rest more or less prolonged.

The drain upon their chemical composition is therefore not heavy, though more than is demanded for many uses to which

such cells are put. One very important requirement is that their construction be such that they are free from local action and deterioration during their periods of idleness. Another, that when in action, their output of current be continuous and unfluctuating.

It is now three years since we began tests in the Electro-Therapeutic Laboratory of the University of Michigan with the view of determining the most efficient forms of dry-cell for constant current work in electro-therapeutic practice. Former reports of the committee have recorded the results obtained from the chloride of silver, the Mesco, the Excelsior, the Vole, and the Standard.

I have to-day to give you the results of a year's test of cells of the Columbia type.

The plan adopted in the first instance is the one adhered to in all the tests so far made for this purpose. The test has had for its object chiefly to determine the constancy in action and the durability of these cells for electro-therapeutic uses.

A certain number, from 30 to 50, are connected in series by insulated copper wire, the initial voltage tested by a Weston Standard voltmeter, the circuit closed through a resistance corresponding to the average resistance met with in a treatment upon the body (2000 to 3000 ohms) when the skin is included in the circuit and the average sized electrodes, with covers moistened in 1 per cent. salt solution, are used. The current is then read and recorded from a Weston milliamperer meter and the circuit left closed for 15 or 20 minutes, the usual period of a treatment, when the current is again noted and the final electro-motive force recorded. On certain days but one, on others, several of these periods of closed circuit were made, so as to subject the cells as nearly as possible to the conditions they would meet in the physician's practice.

A glance at the record sheets, copies of which I herein submit, will show how this form of dry cell, the Columbia, has stood this test. Constancy and durability it has shown to a remarkable degree, and a certain change, a corrosion of the enclosing zinc covering and a tumefaction or bulging of the sides of the cells at the point of corrosion, which has been observed in so many other forms of dry cell, I have never seen in the cells of this make. This corrosive action of dry cells, which I have noticed in many other types, takes place whether the cell is in action or not and always to its detriment. It seems to be due either to an excess of acid, as a primary condition in the semi-fluid electrolyte, or such instability in that electrolyte that local action takes place when the circuit is open. This defect seems to have been overcome in the construction of the electrolyte used in the Columbia cell and seems to fit it, in this as in other particulars, for electro-therapeutic service to the exclusion of many if not all other forms of dry cell now on the market.

ELECTRO-THERAPEUTIC LABORATORY—UNIVERSITY OF MICHIGAN.

Thirty-three Columbia Dry Cells in Series—Constant Resistance of about 2640 ohms in Series.

	Date 1902	Time of running Minutes	Initial V.	Initial cur- rent	Final V.	Final cur- rent Amperes
October	14	45	48.0	.620	48	.020
	15	40	48	.020	48	.020
	16	60	48	.020	48	.020
	17	60	48	.020	48	.020
	20	45	48	.020	40	.020
	21	60	47.8	.019	47.7	.019
	23	90	48	.020	47.9	.019
	24	45	47.8	.019	47.8	.019
	27	40	48	.020	48	.020
	29	40	47.8	.019	47.8	.019
	31	40	48	.020	48	.020
November	1	60	48	.020	47.8	.019
	3	60	47.9	.019	47.8	.019
	4	60	47.8	.019	47.8	.019
	6	40	48	.020	48	.020
	7	30	48	.020	48	.020
	10	40	47.8	.019	47.8	.019
	11	60	47.6	.019	47.6	.019
	12	60	47.8	.019	47.8	.019
	13	30	47.5	.019	47	.019
	16	60	47.5	.019	47	.019
	19	50	47.3	.019	47	.0185
	20	60	47.4	.019	47	.0185
	21	60	47.2	.019	47	.018
December	8	50	47.5	.019	47.2	.019
	9	47	47	.019	47	.019
	10	60	47	.019	47	.019
	11	60	47	.019	47	.019
	15	60	47	.019	47	.019
	16	60	47	.019	47	.019
January	12	60	47.5	.019	47.4	.019
	13	60	47.4	.019	47.3	.019
	14	60	47.5	.019	47.4	.019
	15	60	47	.0185	47	.0185
	16	60	47	.019	47	.019
	19	60	47	.019	47	.019
	20	40	47	.019	47	.019
	21	60	47	.019	47	.019
	22	50	47	.019	47	.019
	23	60	47	.019	47	.0185
	26	60	47	.019	47	.019
	27	60	47	.019	47	.0185
	28	60	47	.019	46.9	.0185
	29	60	47	.019	46.8	.0185
	30	60	47	.0188	46.7	.0185
February	2	60	47-	.0118	46.7	.0185
	3	60	47-	.0187	46.6	.0184
	4	60	47-	.0187	46.6	.0185
	5	60	47-	.0187	46.7	.0184
	6	60	46.8	.0186	46.6	.0184
	9	60	46.8	.0186	46.6	.0184
	10	60	46.8	.0186	46.5	.0184
	11	60	46.6	.0185	46.4	.0183
	12	60	46.5	.0184	46.3	.018
	13	60	46.6	.0185	46.	.018
	16	60	46.5	.0184	46.	.018

Society Meetings.

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	Date 1902	Time of running Minutes	Initial V.	Initial cur- rent	Final V.	Final cur- rent Amperes
February	17	60	46.6	.0184	46	.018
	18	45	46.5	.0183	46	.018
	19	60	46.3	.0182	46	.018
	20	60	46.2	.018	46	.018
	23	60	46	.018	46	.018
	24	60	46	.018	46	.018
	25	45	46	.018	46	.018
	26	46	46	.018	46	.018
	27	60	45.8	.018-	46	.0179
	Now changed to 26 cells in series, resistance unchanged					
March	2	60	36	.017	36	.017
	3	60	36	.017	36	.017
	4	60	36	.017	36	.017
	5	60	36	.017	36	.017
	6	60	36	.017	36	.017
	9	60	36	.017	36	.017
	10	60	36	.017	36	.007
	11	60	36	.017	36	.107-
	12	60	36	.017-	36	.0168
	13	60	36	.017	36-	.0168
	16	60	36	.017	36	.0168
	17	60	36-	.017-	35.8	.0167
	18	60	36-	.017-	35.8	.0168
	19	60	36-	.017-	35.8	.0167
	20	60	35.8	.0168	35.7	.0167
	23	60	35.8	.0168	35.7	.0167
	24	60	35.8	.0168	35.6	.0166
	25	60	35.7	.0167	35.6	.0166
	26	60	35.6	.0166	35.5	.0165
	27	60	35.6	.0166	35.5	.0165
April	30	60	35.6	.0167	35.6	.0166
	31	60	35.6	.0167	35.5	.0166
	1	60	35.6	.0167	35.5	.0166
	2	60	35.6	.0167	35.5	.0165
	3	60	35.7	.0167	35.6	.0166
	6	60	35.7	.0166	35.6	.0165
	7	60	35.5	.0165	35.5	.0164
	8	60	35.6	.0166	35.5	.0185
	9	60	35.5	.0165	35.5	.0165
	10	60	35.5	.0165	35.5	.0164
	13	60	35.5	.0164	35.4	.0164
	14	60	35.5	.0165	35.4	.0164
	15	60	35.5	.0165	35.3	.0163
	16	60	35.4	.0165	35.4	.0164
	17	60	35.4	.0164	35.3	.0163
	20	60	35.4	.0164	35.4	.0163
	21	60	35.4	.0164	35.3	.0163
	22	60	35.4	.0164	35.3	.0163
	23	60	35.4	.0164	35.3	.0162
May	24	60	35.4	.0164	35.3	.0163
	27	60	35.3	.0164	35.2	.0163
	28	60	35.3	.0164	35.2	.0162
	29	60	35.3	.0163	35.2	.0162
	30	60	35.3	.0163	35.2	.0162
	1	60	35.2	.0162	35.2	.0162
	4	60	35.2	.0162	35.2	.0162
	5	60	35.2	.0162	35.2	.0161
	6	60	35.2	.0162	35.1	.0161
	7	60	35.2	.0162	35.1	.0161
	8	60	35	.0161	35	.0161
	11	60	35	.016	35	.016

	Date 1902	Time of running Minutes	Initial V.	Initial cur- rent	Final V.	Final cur- rent Amperes
May	12	60	35	.016	35	.016
	13	60	35	.016	35	.016
	14	60	35	.016	35	.016
	15	60	35	.016	35	.016

Six Columbia Dry Cells in Series. Graphite resistance of about 575 ohms in series with them to reduce the current.

	Date 1902	Time of running Minutes	Initial V.	Initial cur- rent	Final V.	Final cur- rent Amperes
October	14	45	8.8	.014	8.8	.014
	15	40	8.8	.014	8.8	.014
	16	60	8.8	.0143	8.8	.014
	17	60	8.9	.015-	8.8	.014
	20	45	8.9	.015-	8.8	.0145
	21	60	8.8	.015	8.8	.0145
	23	90	8.8	.015	8.7	.014
	24	45	8.8	.015	8.8	.014
	27	40	8.8	.015-	8.8	.0145
	29	40	8.8	.0145	8.8	.0143
	31	40	8.8	.0145	8.8	.0145
November	1	60	8.8	.0145	8.8	.0145
	3	60	8.8	.0145	8.8	.0145
	4	60	8.8	.0145	8.6	.0144
	6	60	8.8	.0145	8.6	.0144
	7	30	8.6	.0144	8.6	.0144
	10	40	8.6	.0144	8.6	.0144
	11	60	8.6	.0144	8.6	.0144
	12	60	8.6	.0144	8.5	.0143
	13	30	8.6	.0144	8.5	.0143
	16	60	8.6	.0144	8.5	.0143
	19	60	8.6	.0144	8.6	.0143
	20	60	8.6	.0143	8.5	.0142
	21	60	8.6	.0143	8.5	.0142
December	8	50	8.6	.0143	8.5	.0142
	9	30	8.6	.0143	8.5	.0142
	10	60	8.6	.0143	8.5	.0142
	11	60	8.5	.0142	8.5	.0142
	15	60	8.5	.0142	8.5	.0142
	16	60	8.5	.0142	8.5	.0142
January	12 (1903)	60	8.6	.0143	8.5	.0142
	13	60	8.5	.0143	8.5	.0152
	14	60	8.5	.0143	8.5	.0142
	15	60	8.5	.0143	8.4	.0142
	16	60	8.5	.0143	8.4	.0142
	19	60	8.5	.0143	8.4	.0142
	20	60	8.5	.0143	8.4	.0142
	21	60	8.5	.0143	8.4	.0142
	22	60	8.5	.143	8.4	.0142
	23	60	8.5	.0143	8.4	.0142
	26	60	8.5	.0143	8.4	.0142
	27	60	8.5	.0143	8.4	.0142
	28	60	8.5	.0143	8.4	.0142
	29	60	8.5	.0143	8.4	.0142
February	30	60	8.5	.0143	8.4	.0142
	2	60	8.5	.0143	8.4	.0142
	3	60	8.4	.0143	8.4	.0142
	4	60	8.4	.0143	8.4	.0142
	5	60	8.4	.0142	8.4	.0142
	6	60	8.4	.0142	8.4	.0142
	9	60	8.4	.0142	8.4	.0142

Society Meetings.

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	Date 1902	Time of running Minutes	Initial V.	Initial cur- rent	Final V.	Final cur- rent Amperes
February	10	60	8.4	.0142	8.4	.0142
	11	60	8.4	.0142	8.4	.0142
	12	60	8.4	.0142	8.4	.0142
	13	45	8.4	.0142	8.4	.0142
	16	60	8.4	.0142	8.4	.0142
	17	60	8.4	.0142	8.4	.0142
	18	45	8.4	.0142	8.3	.0142
	19	60	8.4	.0142	8.3	.0141
	20	60	8.4	.0142	8.3	.0141
	23	60	8.4	.0142	8.3	.0141
	24	45	8.4	.0142	8.3	.0141
	25	60	8.4	.0141	8.3	.0141
	26	60	8.3	.0141	8.2	.014
	27	60	8.3	.0141	8.2	.014
March	2	60	8.3	.0141	8.2	.014
	3	60	8.3	.0141	8.2	.014
	4	60	8.3	.0141	8.2	.014
	5	60	8.3	.0141	8.2	.014
	6	60	8.3	.0141	8.2	.014
	9	60	8.3	.0141	8.2	.014
	10	60	8.3	.014	8.2	.014
	11	60	8.2	.014	8.2	.014
	12	60	8.3	.014	8.2	.014
	13	60	8.3	.014	8.2	.014
	16	60	8.3	.014	8.2	.014
	17	60	8.3	.014	8.2	.014
	18	60	8.3	.014	8.2	.014
	19	60	8.3	.014	8.2	.014
	20	60	8.3	.014	8.2	.014
	23	60	8.3	.014	8.2	.014
	24	60	8.3	.014	8.2	.014
	25	60	8.3	.014	8.2	.014
	26	60	8.3	.014	8.2	.014
	27	60	8.3	.014	8.2	.014
	30	60	8.3	.014	8.2	.014
	31	60	8.3	.014	8.2	.0138
April	1	60	8.3	.014	8.2	.0138
	2	60	8.3	.014	8.2	.0138
	3	60	8.3	.014	8.2	.0138
	6	60	8.2	.014	8.2	.0138
	7	60	8.2	.014	8.2	.0138
	8	60	8.2	.014	8.2	.0138
	9	60	8.2	.014	8.2	.0138
	10	60	8.2	.014	8.2	.0138
	13	60	8.2	.0138	8.2	.0138
	14	60	8.2	.0138	8.2	.0138
	15	60	8.2	.0138	8.2	.0138
	16	60	8.2	.0138	8.2	.0138
	17	60	8.2	.0138	8.2	.0138
	20	60	8.2	.0138	8.2	.0138
	21	60	8.3	.0138	8.2	.0138
	22	60	8.2	.0138	8.2	.0138
	23	60	8.2	.0138	8.1	.0136
	24	60	8.2	.0138	8.1	.0136
	27	60	8.2	.0136	8.1	.0136
	28	60	8.2	.0138	8.1	.0136
	29	60	8.2	.0138	8.1	.0136
	30	60	8.2	.0138	8.1	.0136
May	1	60	8.1	.0136	8.1	.0136
	4	60	8.1	.0136	8.1	.0136
	5	60	8.1	.0136	8.1	.0136

	Date 1903	Time of running Minutes	Initial V.	Initial cur- rent	Final V.	Final cur- rent Amperes
May	6	60	8.1	.0136	8.1	.0136
	7	60	8.1	.0136	8.1	.0136
	8	60	8.1	.0136	8.1	.0136
	11	60	8.1	.0136	8	.0135
	12	60	8.1	.0136	8	.0136
	13	60	8.1	.0136	8	.0135
	14	60	8.1	.0136	8	.0135
	15	60	8.1	.0135	8	.0135

Dr. Emil Heuel asked if Dr. Herdman had had any experience with the Cooper-Hewitt converter.

Mr. Brown asked how the Columbia dry cell compared with the Standard cell.

Dr. Herhman said that he had not seen the converted referred to, and knew nothing whatever about it. The committee was always willing to test any such apparatus if it were sent to the laboratory of the University of Michigan. He had found that the Standard cell buckeled a good deal, although the constancy and durability of this cell was the best he had found up to the time of testing the Columbia cell.

MEETING OF THE CLINICAL SOCIETY OF THE NEW YORK SCHOOL OF PHYSICAL THERAPEUTICS.

Stated Meeting, November 20, 1903. G. Betton Massey in the chair.

Paper, "The Pioneers in Psychiatry," by Dr. Leslie Meacham.

Discussion.

Dr. G. Betton Massey: The paper is a most interesting presentation of an important subject. It is of interest to me from two points of view. In the first place, our lamented friend, Dr. Pilgrim, got a notion that I was prejudiced against suggestive therapy. It is true I have a feeling at times that it is a subject to be discussed by physicians behind closed doors. It should be kept in their own hands. It has been in ignorant hands as shown by the faith-curists. Physicians have known for years the power of suggestion. Another point was noted when Dr. Meacham said of Charcot: I agree that the more modern views of Charcot are that he was greater in neurology than in psycho-therapy.

Dr. William Benham Snow: It is refreshing to have an occasional historical discourse. The power of mind over mind has always been looked upon with superstition. We recognize these forces not only in therapeutics but in everyday life. No physician fills his position without any exercise of the power of his mentality over the condition of his patient. History parallels facts—the merging of civilization into light.

The Christian Scientists have held out power of faith in connection with other absurd notions, and have demonstrated how even so this power can be exercised. With the physician's employment of psychotherapy in a scientific manner much good will follow its more general adoption into therapeutics.

Dr. Morris W. Brinkmann; I value the paper for what it says and for what it implies. There are two schools of philosophy, mental and material. A man wrote a book forty years ago called "Force and Manner," in which he said that matter never existed with the existence of force.

If bodies of the medical profession are so unwise as to hold themselves to narrow and bigoted views, they will be swept away by the judgment of force.

I believe it is our duty not to make an unfavorable prognosis.

As the preceding speaker stated, there is no branch of science to-day that will not become more exact.

A physician should not only relieve conditions of a physical character, but also mentally. I personally thank the writer of this paper for it is beautiful.

Dr. Herman Grad: The paper is not one for discussion; it gives one food for thought. It is difficult to realize that such a state of mentality can be produced as to cause absence of pain. I am ignorant of the subject, but I have enjoyed this historical sketch and it has given me something to think about.

Dr. G. Betton Massey: The promises of charlatans remind me of the saying of the poet Ennius, 200 A. D.: "Go to, ye fortune tellers and soothsayers who promise us a fortune if we give but a drachma. Give me the fortune and I'll then give you the drachma."

Dr. Leslie Meacham: Charcot and Dercum, from the standpoint of suggestion, are as good as I have ever read, but from hypnotism as bad as any. It is possible that hypnosis may amount to a pathological state but it is not necessary.

Dr. Herman Grad opened the discussion upon the therapeutic uses of the X-ray, presenting a case of leukaemia, with which he had had remarkable results. (See paper elsewhere in this JOURNAL.)

Dr. Wm. Benham Snow: You rayed twenty minutes daily but changed the position of the tube.

Dr. Herman Grad: Yes; the anode was never allowed to stay in one place for more than five minutes.

Dr. Margaret A. Cleaves: I think that Dr. Grad has obtained beautiful results without producing a dermatitis. I have never produced an X-ray burn, I think. It is noticeable that the spleen and glands diminish in size. I think Pusey says that the spleen increased in size in toxæmia, leading to fatal results and also in malignant disease.

Dr. Stevens: I think it a wonderful result. It is the best

result that I have seen. I had a case last week which I hope the X-rays will help. Two years ago a woman, 55 years old, had her breasts removed. Last summer glandular enlargement and prostration were noticeable. An expert said X-rays would not help, but the pain has been removed, but I fear that the patient will die in a few months.

I came here a year ago when Dr. Newman was an energetic worker with you. I enjoyed the meeting then, and have to-night.

Dr. Morris W. Brinkmann: The writer of the last paper gave me some slides. I now have single and multiple stained slides. From the latter I believe the case one of leukæmia. The essential characteristic of this type is that it is a more acute type with greater febrile movements and possibly of the hemorrhagic type. You have a lymphocytosis. You have a lymphocyte,—a mass of protoplasm large in comparison with the nuclei.

The relative number of red and white blood corpuscles is a matter of discussion. If you make a blood count the relative number of red to white is as one white to from three to five hundred red in normal blood. In leucocytosis it is as one to fifty, in leucocythæmia one to three or five. Some have placed it as high as twelve.

Now as to prognosis. The course of the lymphatic is briefer than that of the splenic. The doctor's findings are brilliant.

Dr. Wm. Benham Snow: I am pleased at Dr. Grad's presentation. It opens another field to conquer. We began using it in malignant disease, neoplasms, etc. We used it to destroy diseased tissue, but we find it constantly enlarging its scope. My own experience has led to success in so many cases that we now use it with rationalism. When we successfully treat a case of chronic membranous colitis as has Dr. Grad, and as we have also in the school or when we can see a gumma tumor disappear, we wonder at its limitations. To me the action of the X-ray, like light, is one of vibration. The greater the rate, the greater the chemical action. It is an influence, rational and simple, probably producing contraction of the cell.

Dr. Morris W. Brinkmann: I forgot to state that the red blood corpuscles contain pigmented particles, plasmodia. The sclera of the patient is yellow. It is a brilliant result considering the time that has elapsed.

Dr. Caldwell: It is interesting to note the temperature of the target. The temperature of the target is influenced by difference of potential of strength, of tube, of rate, and of current.

Dr. G. Betton Massey: It seems to me that it is impossible to work with X-rays without believing in microbic origin. We have here a method of killing the germs, it may be by strengthening the body. Those engaged in pioneer work have a wide field before them. We have to work in the dark. We

must find out which germs will yield to the X-ray and which will not.

Dr. Sigismund Cohn: Dr. Senn has reported a case of leukæmia cured; he believes with Dr. Massey that we have to deal with germs.

Dr. Herman Grad: Mr. Chairman, I am glad to hear that we do not have to get a dermatitis to cure. It may be admissible to get a dermatitis in affections of the skin. No dermatitis is admissible as you can ray more. As regards enlargement of the spleen in toxæmia, it is new to me.

As to Dr. Brinkmann's remarks about plasmodia I have not seen any. I wish to say one of Dr. Senn's cases was Hodgkin's disease, and the other one was lymphatic leukæmia.

You cannot distinguish except by the blood. Recently Dr. Kelly wrote that both myelogenic and spleno-medullary are of the same type.

Dr. Snow and Dr. Caldwell say the tube determines the amount of rays. I always used the same tube. It never got red but it was comfortably hot. I have 140 pounds of lime in my machine and it works in every temperature.

Dr. Delphay then made a demonstration of his multiple interrupters for use with low vacuum tubes. The series interrupters are placed upon the handles of the discharging rods of the static machine.

Next meeting of the Society will occur Friday evening, January 15th. Subjects: High Potential and High Frequency Currents, with demonstration, and Mechanical Vibration, with exhibits of apparatus.

Errata.—Dr. Chisholm Williams' work on High Frequency Currents published by Rebman Company is sold for \$2.75 instead of \$2.00 as stated in the review.

NEW AND IMPROVED APPARATUS.

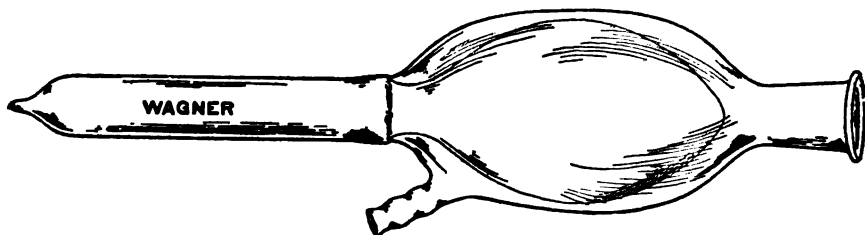
— This department is devoted to publishing, with illustrations, drawings, and descriptions, new apparatus, electrodes, etc., for the benefit of those interested in the progressive improvements in armamentaria.

THE HUGHES IONIZER.

This instrument is excited in the same manner as a high frequency tube. The vacuum tube acts inductively upon the air and such substances as may be held in suspension by it while passing through the chamber between the inner and outer bulb. The inner bulb is exhausted and the outer bulb merely forms an air chamber around it. The outer bulb is provided with a nipple to which a tube leading from a nebulizer or other apparatus for medicating the air may be attached. The opening to which the mouth or nose piece is to be attached is made like the mouth of a bottle, so that a rubber cork, to which any desired shaped attachment may be made, can be used, and when

removed will leave the instrument all glass, so that it can be washed, boiled, or otherwise cleaned.

The inductive action arising from the extremely high mode of motion imparted to the rarefied air of a vacuum tube, produces a much finer disintegration or decomposition of the substances acted upon than a direct discharge of current passed through substances, or than an inductive action arising from metallic bodies. It is on account of the absolutely perfect decomposition of the air and substances held in suspension by it when acted upon by this instrument, as above described, that it is called an ionizer, the molecules being broken into atoms and the atoms into ions. The main advantage, however, of the peculiar construction of the Hughes Ionizer, is that it affords a perfect means of neutralizing the acid effects of de-



composed nitrogen. If the air acted upon by it be made to carry in suspension, by means of a nebulizer, some medication of an alkaline character, the acid effect of the decomposed nitrogen combining with the hydrogen is entirely neutralized. The remedies held in suspension by the air, as produced by a nebulizer, are much more finely subdivided, thus rendering them more efficient in the treatment of the air passages. The cloud of vapor produced by a nebulizer is more than doubled by the action of the ionizer.

This ionizer may also be connected to a tank of pure oxygen gas instead of a nebulizer, and pure ozone without nitrogen may be used. Altogether it is a very simple, most efficient instrument, and will be found much more practical and effective in therapeutical work than ozone generators such as are now in use.

One of the best ways to use the ionizer is to connect it to one terminal of a high frequency apparatus (a static machine running at high speed so as to produce a high frequency current) in the same manner as the high frequency tubes are attached; allow the patient to grasp the double bulb of the ionizer in one hand and regulate the strength of the current so as to produce slight electrical sensations of the patient, when the air may be sucked through the ionizer directly, or indirectly through any medication. Or the air may be forced through from a nebulizer or atomizer.

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EXOPHTHALMIC GOITER AND ITS RATIONAL TREATMENT.*

BY FRANCIS B. BISHOP, M. D., WASHINGTON, D. C.

Member and ex-President of the American Electro-Therapeutic Association; Member and ex-President of the Medical and Surgical Society of the District of Columbia; Member of the Medical Society of the District of Columbia; Member of the French Society of Electro-Therapeutics, Paris, France, etc.

The symptom complex of the disease known as Graves' disease or exophthalmic goiter, has been for years and seems still to be of the deepest interest, and a subject unusually susceptible of intense consideration and study. The etiology, so necessary to the intelligent treatment of disease, in this is the subject of many theories, all of which seem to be deficient at some point, and none are capable of accounting for all the symptoms found in a thoroughly developed case. One point upon which all authorities seem to agree, is that the disease is very much more common in the female than in the male, and that in the large majority of cases, it makes its appearance between puberty and the menopause. That the four cardinal symptoms usually make their appearance in regular order, as follows: anæmia, tachycardia, hypertrophy of the thyroid gland and exophthalmia; accompanied by the well-known trophic and vasomotor disturbances, excessive perspiration, pigmentation of the skin, diarrhea, physical exhaustion, and loss of flesh, etc.

If the four principal symptoms were always present and by their presence and prominence always marked the severity of the disease, then the process of reasoning, from effect to cause, would be simplified, but unfortunately such is not the case; hence the great number of theories, none of which seem to meet all the conditions.

* Read at the thirteenth annual meeting of the American Electro-Therapeutic Association at Atlantic City, September 23, 1903.

We will take the chief symptoms in their order and take notes as we proceed. Anæmia; when we compare the cardiac symptoms of simple anæmia and the cardiac symptoms of exophthalmic goiter, we find symptoms differing in degree, rather than in similarity. "In anæmia, the subject may complain of weakness and pain about the body and head, marked shortness of breath upon slight exertion, accompanied by palpitation of the heart, a tendency to faint, with pain and distress over the cardiac region. A systolic murmur is often heard over the pulmonary artery and at the base of the aorta in the mitral area and sometimes over the whole præcordia, with second sound accentuated. Over the cervical vessels a systolic murmur is commonly audible, followed by a sharp sound; in the neck a loud venous hum. The cervical vessels may throb, the radial pulse is small, weak, and of variable but usually increased frequency and suddenness. There is a tendency to hemorrhage, especially epistaxis and petechiæ are occasionally observed. Headache, tinnitus aurium and other cerebral symptoms are common. There may be swelling of the optic disc."*

Oppenheim's Diseases of the Nervous System, in speaking of the symptoms of Graves' disease says: "The tachycardia is the most important. It occurs in all cases and in the initial stage, it may be regarded as the first symptom. The frequency of the pulse varies between one hundred and two hundred. The pulse is generally small and soft, while the *arterie pulsale* strongly and noticeably. The frequency of the pulse is increased by mental excitement, without, however, it being entirely a result of increased mental irritability. In addition to the chronic acceleration, attacks of tachycardia and delirium cordis have been observed; we may occasionally detect a systolic murmur at the base of the heart. Signs of mitral insufficiency have been observed in some cases."

"The superficial veins are generally dilated, the hand may occasionally detect a distinct thrill over the thyroid or near it and auscultation reveals a systolic bruit."

Hysteric or neurasthenic symptoms are very common in the early stages as well as through the whole course of the disease, and we know that the cardiac symptoms accompanying these conditions are often severe.

Those who have suffered from cardiac palpitation from any

* Quain's Dictionary of Medicine.

cause, will recall the fact that the sensation is felt no more in the cardiac region, than in the front of the neck. In the thyroid region, the sensation is very perceptible, accompanied by a feeling of impending danger. Many subjects are very much frightened and the orbits seem to protrude, and at the same time an expression of great mental agony is often marked. This pulsation in the neck leads us to a consideration of the thyroid gland, which consists of two lobes and occupies a position in front of the neck, one lobe in each side of the trachea. Its weight varies from one to two ounces. It is larger in females than in males and becomes slightly increased in size during menstruation and after maternity. The right lobe is the larger of the two.*

The function of this gland is not fully known; yet it is pretty generally conceded that its secretions plays a very important part in metabolism. Another and very important function, which to the writer seems plain, when the position on the front of the neck, between the heart below and the brain and superior spinal centers above is considered, together with the enormous blood supply through arteries altogether out of proportion seemingly to the size of the gland. These arteries, coming as they do from the lower portion of the large vessels in the neck, would indicate that this gland, sponge-like and distensible, might act as a receptacle to shunt or switch a great part of the current of blood from the small and delicate vessels of the brain and higher spinal or cerebro spinal centers, thereby protecting these centers from damage by the increased blood pressure when the heart is acting with great force and frequency. The free anastomosis of its arteries, the size and number of its veins, together with the rich supply of lymphatics and their large size would seem to fit this organ for the greatest amount of pressure under normal conditions without injury.

Exophthalmos, or undue prominence of the eyes, exists to a limited degree in many individuals, who to all appearances are in a normal state of health. It may be noticed to a moderate degree in hydrocephalus. The act of stooping will produce it temporarily in some subjects, which has been attributed by (Vossius) to a varicose dilatation of the retro-bulbar veins. The eyeball occupies a position in a bony socket with little room except for the play of its muscles, lying upon a bed of fat and

* Gray's Anatomy.

richly supplied with blood-vessels. The eyes quickly show the effects of physical or mental suffering, by a loss of fat in the socket and retraction of the balls; while under the influence of fear or sudden fright they are made to bulge perceptibly, perhaps through an increased blood supply to the orbit and sphere in consequence of the temporary over action of the heart, due to a shock to the higher nerve centers.

Much has been written as to the influence of the sympathetic system of nerves, as also of the pneumogastric nerve as the cause more or less direct of this disease; both the sympathetic system and the pneumogastric nerve undoubtedly play a very important part in the symptomatology, but there is much doubt in the mind of the writer as to their causative relation.

As we have seen, the disease is very much more common in females than in males; that the period of life in which it most frequently makes its appearance, is between puberty and the menopause; that the thyroid gland is larger in females than in males. That tachycardia is the first appreciable symptom. This leads us to the consideration of the conditions necessary to a perfect action of the heart. A normal action of the heart depends, first, upon the condition of the heart muscles itself; second, the influence of the central nervous system; third, the amount of blood passing into the heart cavities; fourth, the coronary circulation; fifth, the amount of pressure to be overcome; sixth, the quality of blood supplied to the heart and central nervous system, and seventh, the heart *must* have sufficient room to contract. It must not be unduly pressed upon.

According to all records upon the subject, when God made man and his mate, He made them physically and morally perfect and through the vanity of man and his efforts to improve upon God's work, has much suffering befallen the human race. Even as early as the Roman republic and the Empire, the Roman matrons wore bandages resembling corsets, for the purpose of supporting the breasts, but afterwards, to compress the form so as to give it an air of comeliness, which was considered one of the attributes of beauty. Prior to the French Revolution, corsets of German invention had been worn for several centuries, which contained rods and plates of whale-bone and steel, and were designed to conceal the defects and exaggerate the beauties of the figure. So injurious had the tight lacing of these corsets become, that Emperor Joseph, the

Second, found it necessary to issue an edict against the use of corsets in all public institutions. This was probably about forty years before Dr. Graves described the disease under consideration as a symptom complex.

The developing period of a girl's life is spent usually at school, the hours of recreation are short, she must dress as a lady, she must act as a lady, she must be refined. The corset is worn early to give the body a beautiful tapering shape, with the result that the lungs, heart, liver, and spleen are compressed directly, and the rest of the viscera indirectly. The appetite for sweets and pickles is good, but for the more substantial food indifferent. When the first great change in her life makes its appearance, the undeveloped pelvic vicara are unable to properly perform their function. The blood, the muscles and the nerves are below the standard of strength in consequence of poor nourishment, the lack of exercise and sunshine, and now the nervous system receives its first great shock. Those who have inherited a good resisting power may pull through with little trouble, but this does not hold good with those of a constitutionally depraved nervous system. The heart pressed in, between the irresisting corset on the outside, and the diaphragm, lungs, backbone and, perhaps, distended stomach and intestines on the inside makes a terrible effort to do its duty. If the blood is poor in quality, it renders the work of the heart doubly laborious. Hysterical spells become common in consequence of a poorly nourished brain; digestion is impaired, flatulence, and eructation of gas; sudden and severe sensations of fear, with a feeling of pressure in the precordial region, palpitations, and often causing bulging of the eyes together with a choking sensation in the throat. Anæmia when not already present, may gradually develop and embarrass the action of the heart still more by a supply of poor nourishment to the central nervous system. This condition may go on for years, sometimes better, sometimes worse. Tachycardia becomes frequent, as a means to increase the supply of blood to the centers, through the action of the sympathetic system, cardiac and cervical ganglia. The vagus center, being the most easily stimulated, is likewise most easily depressed, and first loses control of the heart's action, the sympathetic taking full control, until enough blood has been supplied to temporarily furnish nourishment, when the pneumogastric again resumes its

work. Each attack of tachycardia transmits its impression to the thyroid gland and distends it with blood, and eventually hypertrophy begins and often continues, until the gland reaches an enormous size. The blood supply to the organ is greater than the outflow, hence the distended condition of the veins. By the same course of reasoning, the eyeball and orbit next feel the excessive flow of blood during the periods of augmentation of the heart's action. After the thyroid has become enlarged and resists the further flow of blood, the pressure increases in the eyeball and orbit, and as the eyeball is distended, and pressed upon behind, it must protrude. Eventually, the unusual and spasmodic flow of blood to the brain would tend to produce the mental symptoms so frequent in a well developed case of Graves' disease. As the thyroid increases in size pressure upon the vessels and nerves in the neck increases the discomfort. Whether the secretion of the thyroid is increased or diminished, is as yet an unsettled problem; the disorders of nutrition would indicate that there is probably an excess of this secretion, and that this plays an important part in exciting the sympathetic ganglia, or paralyzing the vagus center in the medulla. Especially does this seem reasonable in the light of recent cases reported benefited by the removal of the gland.

The writer does not claim that this disease is always the result of tight lacing, or that it immediately follows. It may take years to develop, and then only after some severe shock to the nervous system. He believes that anæmia, as a result of faulty nutrition, is often a predisposing cause. The fact that women have larger thyroids than men would seem to indicate that nature has provided them with an excess of this gland as a protection to their nerve centers against the numerous nervous and cardiac disturbances to which they are subjected. And the fact that we may see cases with enlarged thyroids and no exophthalmia, might indicate that the blood pressure in the eye and orbit has not been excessive, or when they appear with exophthalmia without the thyroid being enormously enlarged, we might say that the thyroid in those few cases are not so distensible or subject to a high degree of hypertrophy.

The proposition is that Graves' disease in many cases is superinduced by early and continued use of the corset. This by pressing upon important organs that are necessary to carry on perfectly the nutritive processes of the body; by confining

the heart in a space too small to perfectly carry on its functions and by increasing external resistance, the soft distensible parts are made to take more blood than necessary, and by faulty metabolism the blood becomes impoverished and inadequate to nourish the heart and the central nervous system. That anæmia, through faulty metabolism, often acts as a predisposing cause.

An abstract from a letter to Dr. J. H. Salisbury from Professor Lesquereaux, who spent much time in the Alps, might be of interest here. He says that goiter is most prevalent along the rivers and at the bottom of some deep valley of the Alpine mountains. The inhabitants of the valley of the Rhone are poor. In this valley goiter is the rule rather than the exception. Their only industry consists in cultivation of vineyards and of small farms. The poor ones mostly live on a kind of very black bread made from the flour and bran of oats. They eat very little meat, if any, drink water and some of their acid wine, but no alcoholic liquors. Higher up in the mountains and on their slopes, the inhabitants are richer, with their pastures and fine herds of cows. Their industry of cheese making is remunerative. They live upon milk in its various decompositions and preparations, and have no goiter. This valley is deep and damp, very little sunshine reaches the inhabitants, summer or winter. In other localities in France where goiter is very common, dampness is not the cause, but here the people subsist upon a corn meal porridge, this being their essential and sometimes only food.*

TREATMENT.

Of the first importance, in consequence of the extreme physical exhaustion in all these cases, rest, as near absolute as possible, becomes necessary. My patients, when they are able to do so, are requested to retire very early in the evening and to remain in bed in a well-ventilated room until the sun is well up; to take their breakfast in bed, and to spend as much time reclining in the sunshine and fresh air as the conditions of weather will permit, with moderate exercise in the afternoon. This is increased as patients improve. All pressure is taken from the ribs, waist, and pit of the stomach; regular and systematic deep breathing is encouraged. Food is a very important element in the treatment of this disease. All conditions point to the necessity for building up of the nervous and muscular tissues,

* Salisbury, *The Relation of Alimentation and Disease.*

and for this purpose nitrogenous food is of the first importance, not only because it is easily digested, but also because nitrogenous organic bodies take the chief part in forming the solid tissues of the body, and are found also to a considerable extent in the circulating fluids (blood, lymph, and chyle), the secretions and excretions.*

The patients will not gain flesh on this food (which should be both animal and vegetable, proteid foods), but they will gain solid tissue, muscular and nervous tissue, which is so necessary in these wasting diseases. A sufficient quantity of good pure water should not be neglected, as it is required to supply the increased loss of water from the blood, that we so often find in these cases. Medicine has been relied on for many years in the treatment of Graves' disease, and after all these years we have only disappointment for our trouble. Surgery has taken these cases up quite extensively of late, and we have had some very encouraging reports, and probably in advanced cases where the goiter is so large as to produce dangerous symptoms by pressing upon important nerve roots and blood vessels, surgery may be justifiable. Owing to the low resisting power of these patients, they should not be subjected to anæsthesia (even local anæsthesia) and operation until all other means have been thoroughly tried. The mortality after operation has not been large and it is yet too early to say what the ultimate results may be. All authorities agree upon one point, and that is, that the best results have been obtained by the use of *electricity*.

Each seem to have their own methods of treatment, but in order to get the best results we must have some idea of existing conditions and of what we wish, or expect to obtain by the use of electricity. By experiment and experience we have learned that the vagus is easily stimulated in the neck from the sub-auricular fossa to the clavicle, and that the vagus may be stimulated with a much weaker stimulus and in much less time than the sympathetic. So with care we may get the inhibitory and other influences of the vagus, without unduly exciting the sympathetic. By stimulating the vagus we hope to produce a slowing and quieting of the heart's action, increase the activity of the entire alimentary tract, stimulate the secretions of the salivary glands, the functions of the liver, spleen, and kidneys.

* Kirk's Physiology.

According to Kirk's Physiology, "any kind of stimulus produces the same effect either chemical, mechanical, electrical, or thermal, but that of these, the most potent is a rapidly interrupted induction current." My preference for the application to the vagus, has been for the continuous current, and my method of application has been to stimulate both nerves at the same time. A large sponge-electrode attached to the positive pole, is placed high up on the back of the neck. A bifurcated cord is used for the negative side, and two small sponge electrodes are placed one on each side over the pneumogastric, in the lower part of the neck and impinging upon the thyroid.

The current is gradually turned on and the pulse noted until a quieting effect is noticed under the sponges and at the wrist, or to the point of tolerance. The current is allowed to remain at that point for ten or fifteen minutes, or longer, until a decidedly quieting effect has been produced. Then the small sponges are placed directly on the gland and the current turned on to the point of tolerance, and is allowed to pass from five to eight minutes. This treatment is persisted in every other day, and in many cases a decided improvement will be noticed in a month. Lately I have been using the high potential high frequency current as an auxiliary, and have been much pleased. One patient begged me to discontinue all other treatment, as she was so much benefited by the high frequency spark applied directly to the thyroid and cervical spine, over the liver, spleen, kidneys, abdomen, and over the region of the ovaries. A letter received a few days ago states that she continues to improve.

In addition to the good effect upon the heart and viscera through the vagus, I am convinced that much good comes from what Dr. Rockwell describes as circulatory drainage. This paper is not produced with the idea that the author has discovered anything new or startling, either in the etiology or treatment of this disease, but with the hope that a study of other and unexplored channels may possibly throw some light upon a subject complex and obscure.

Discussion.

Dr. G. Betton Massey said that he agreed practically wholly with the statements made in this excellent paper. He was reminded of a publication made during the past year by Sajous of Philadelphia on the functions of the thyroid, and

their relation to the functions of the adrenals and the pituitary bodies. His conclusions were arrived at from the study of the literature of the world, containing the experiments of various investigators upon the action of these bodies. He found that the thyroids and adrenals together liberated material which he called adrenoxin. He explained for the first time how the oxygen of the air united with the blood of the body. It was carried in the blood plasma, oxygenizing the body and permitting the chemical processes of the body to take place. The production of this adrenoxin appeared to control the whole chemistry of the body, and it could be easily imagined how disease of one of these glands, the thyroid, could profoundly affect the metabolism of the body. By the application of electricity one made up for a lack of the natural stimulus to the functions of this body. Shortly after the publication of this work by Sajous a pathologist in Buffalo wrote that the theory explained a case that had been previously very puzzling. A man had been brought to the hospital with a fracture of the jaw, which healed slowly and only partially. Meanwhile the patient became yellow, and the blood became vitiated, and the patient ultimately died of exhaustion. At the post-mortem examination on this case, made one year before the publication of Sajous' article, a green line of mortification could be traced up to the sella turcica, and the pituitary body was found to be gangrenous.

Dr. T. A. Pease said that for the past two years he had had some experience in the treatment of this disease, and he had lately developed a method which he could recommend. He used the galvanic and high frequency currents with adrenalin. A four per cent. solution of adrenalin was applied on a copper disk electrode, and the latter was applied to the gland until the skin was thoroughly blanched. He then applied the high frequency current through a modification of Dr. Snow's wooden electrode with an intense vibration produced by means of a spring transformer. This method had given him far better results than any other in exophthalmic goiter.

Dr. A. D. Rockwell said that there were two prevailing theories with regard to exophthalmic goiter; one was that it was due to the influence of the sympathetic nerve, and the other, that it was due to the action of the thyroid gland. Whatever the causes, there were certainly strong indications for the

use of electricity. He personally believed that the galvanic current was far superior to all other methods of electrical treatment in this disease. About twelve years ago he had prepared a rather elaborate paper on this subject, in which he presented an analysis of about forty cases of exophthalmic goitre that had come under his observation in the previous fifteen or twenty years. Of this number, twelve cases had been under his observation and also of his confrères in New York, and all had been cured. Up to that time he had not seen any such record of cures. Since then very few cases had failed to show benefit, and a large number of them had been cured. He attributed his success largely to the thoroughness of treatment. His method consisted in using clay electrodes, because in this way he could make use of stronger currents without damage to the skin. It was absurd to say that one or two milliamperes of current were serviceable in this disease. One could often use seventy-five milliamperes of current with an electrode, two or three inches in diameter, over the cilio-spinal center, while an electrode four or five inches in diameter was placed over the solar plexus. The clay was made very moist, and he used large electrodes having a bottom of block-tin and hard rubber. These were filled up to the brim with the clay. His advice was not to be afraid of the current strength; one should use as much as possible without damaging the skin. As a rule, too much current could not be used on the tissues below the skin.

Dr. William W. Eaton said he was very glad to hear Dr. Rockwell speak of the galvanic treatment of these cases, because it was the method that he had himself followed for the past eight or ten years. He could strongly corroborate what had been said about the improvement and apparently absolute cures effected by such treatment. He could recall only one case in the ten years which had not been symptomatically cured, and certainly with an entire disappearance of the enlarged gland. His method of application had been almost precisely that recommended by Dr. Rockwell. He made use of a large soft clay electrode with a flexible copper back, which could be fitted around the growth, and he always used at least thirty or forty milliamperes, and often a very much stronger current. A recent case was that of a woman of sixty-six years, who had had a growth for a number of years. It measured three and a half inches from side to side. At the present time this measure-

ment was one inch and a quarter, and the woman appeared to be in every way restored to the normal condition. In this case a current strength of eighty milliamperes had been employed.

Dr. Emil Heuel asked whether an anæsthetic was used with this high amperage.

Dr. Eaton said that there was a warm feeling produced, as from a strong mustard paste, but the pain was entirely bearable.

Dr. Rockwell said that his experience had been that in many of these cases there was no observable influence upon the pulse during the application, and hence he could not understand Dr. Bishop's statement that the current should be applied in a strength of current which would influence the pulse. Personally, he always applied the current up to the point of tolerance.

Dr. Massey said he was glad to see the members becoming bolder in the use of electrical currents.

Dr. Bishop closed the discussion. The two theories mentioned by Dr. Rockwell, he said, had been referred to in his paper. The continuous current had undoubtedly proved of the greatest benefit in these cases, and he had used it exclusively up to a few weeks ago, but since that time he had been using a high frequency current as an auxiliary, and had found it of great benefit—in fact, one patient desired him to make use of the high frequency current only because of the manifest benefit. One person could tolerate with ease one-eighth of a grain of strychnine while another would be thrown into tetanic spasm by one-third that amount. A similar idiosyncrasy was observed with regard to the use of morphine. Similarly it should be remembered that we were making use of different forms of the same agent, electricity, and that they naturally exhibited great individual peculiarities. He had never made use of the clay electrodes because of their inconvenience and dirtiness. He preferred to make use of sponge electrodes with tinfoil backing. A large electrode should be applied on the back, but the size of the electrodes on the neck was not of much importance provided they were small enough to concentrate the current upon the thyroid. If the electrodes were too large, the current would be too greatly diffused into the soft tissues of the front of the neck. He had never had any trouble with burning although patients occasionally complained when an electrode had been applied constantly for twenty or thirty minutes. With regard to the current strength, he had been governed very largely by the effect produced upon the patient, and so far had been very successful in this regard. The patient was placed in a reclining position, and the current was turned on very gradually. Of course, he watched the milliamperemeter, and sometimes ran the current up to fifty or sixty milliamperes, but it was not often that such a current strength seemed to him desirable.

THE PHYSIOLOGICAL ACTION OF LIGHT AND THE
PHYSICAL FACTORS IN PHOTOTHERAPY.

BY MARGARET A. CLEAVES, M. D.

From the physiological action of light, therapeutic effects may not only be predicated, but, as is well known, are actually obtained.

In the use of light therapy however, different sources of light, different methods of arranging light mechanisms giving different light values are employed indiscriminately by different observers. One may use sun light, another the incandescent light, a third the electric arc, a fourth the Görl lamp excited by the spark from a static machine or a high tension coil, and yet a fifth, vacuum tubes similarly excited. An incandescent lamp or series of lamps may be used with bulbs of ordinary glass or a single lamp with a bulb of blue glass. If the electric arc, there may be used all the radiant energies of one or more open arcs, a carbon arc of high amperage with condensing lenses of quartz and a water cooling chamber, a water cooled iron electrode arc with non-focal lenses of quartz, a marine search light with or without a blue-glass screen intervening, the same with an especial adjustment for skin work or an arc with large thick plano convex lenses of glass.

From the reports of results obtained by the use of the different sources of light and by these manifold arrangements of light mechanisms giving various degrees of light energy, it might be concluded, that it did not matter what portion of the spectrum was used and that the different rates of vibration produced similarity of effect. That every rate and frequency of light vibration from the lowest and longest to the highest and shortest so abundantly provided by nature, is necessary to the perfect maintenance of health and life seems a self-evident fact.

But it would be well if it could be accurately determined just what rate and wave length is inimical to the growth of bacilli, and what rate or wave length excites tissue reaction. Is the first a primary action, or is it due to the reaction established in the tissues by the same or other rays?

A moment's glance at the physics of light as it concerns the therapist may be of interest before entering upon a considera-

tion of the physical factors in phototherapy. In the ether, of which light is a manifestation, there must be recognized the eternal recipient and transmitter of nature's infinite energy. At the outset it will be well to remember that the same vibrations, molecular activities varying only in rate and wave length, give the different phenomena of electricity, heat, light, and chemical action, and that these various manifestations of energy by reason of their physical properties are capable of producing similarity of physiological action and therapeutic effect, which differ only in degree not kind. In view of this unity in kind of energy and effect it may be asked is it strange that the differing rates of vibration or wave lengths of light should similarly influence physiological action and therapeutic effect? A case of lupus vulgaris recovers under the influence of ultra-violet rays, likewise a syphilitic lesion; an ulcer heals from exposure to an incandescent light inclosed in a blue-glass bulb; an acute inflammation of the labia majora is absorbed by the use of the Görl lamp, excited by a static machine; an anæmia, a psoriasis, an eczema, asthma, bronchitis, pulmonary tuberculosis yield to all the radiant energies of the arc, without condensation or concentration even, other than in a cabinet, and in a radiant energy bath is to be found in the alloxuric diatheses, nephritis, alcoholism and the drug habit, the very best sudatory, eliminative and at the same time tissue-building agents at the physician's command. To what portion of the spectrum are the effects due? Or, are the different rates of vibration interchangeable? And how should the physician understand the spectrum? These etheric vibrations cover a very wide range of frequencies, from the longest in length and slowest in movement, hence the most infrequent on up the scale until the maximum of high frequencies and exceedingly short wave lengths are reached. There are but a comparatively limited number of these rhythmical vibrations, comparable to the waves of the sea as they beat upon the shore, evident to the human sense of vision. Physiologically those frequencies between 390 and 760 trillions per second are recognized by the eye as light.

To consider a wave of light in its simplest form is to imagine a disturbance consisting of a succession of crests and hollows. A luminous radiation will extend as an unbroken succession of such crests and hollows from the point of origin to the

place where they are absorbed and converted into some other form of energy.

In a laboratory experiment these two points may be separated but a few inches or any number of millions of miles in the case of light from a distant star. The wave length is the distance measured from crest to crest, and is generally expressed in units of a scale of ten millionths of a millimeter.*

The wave length of the vibration is responsible for the sensation of color. Light vibrations recognized as violet are produced by the higher frequencies and shorter wave lengths, red by longer and slower frequencies, while the blue, green, yellow, and orange are produced by the intermediate wave lengths, gradually growing longer and slower from the blue to the orange. As has been pointed out the radiations or wave lengths of light are not confined to the limits of our vision. It is not incorrect physically to speak of *dark light* and by it is understood a series of increasingly long wave lengths, constituting what is known as the infra red region; while beyond the violet is a series of increasingly short waves constituting the important ultra-violet region. The visible region of light is between 4,358 and 7,593 units. The longest radiation of light estimated in units of wave lengths was discovered by Professor Langley of the Smithsonian Institute, Washington, and has a wave length of over 53,000 units.

In the ultra-violet region the researches of Victor Schumann have resulted in the photographic record of waves as short as 1200 units. Broadly these varying rates of frequencies may be divided into the thermal, luminous, and chemical rays. In some methods of administration all these frequencies are active; in others a part of them are eliminated and certain parts of the spectrum alone are active.

But a much more scientific and therefore successful light therapy will be established when it is proven beyond peradventure that definite results are due to definite physical factors. Light therapy will then be comparable to the intelligent drug therapy of to-day. Instead of the old-time method of administering enormous doses of crude cinchona, opium, and nuxvomica, for example, the more refined and exact method of using their active principles, quinine, morphia, and strychnia, known

* "On Some Effects Produced by Radiations." J. H. Gardiner, Archives of the Roentgen Ray, May, 1903.

definitely in the one instance to inhibit the action of the malarial plasmodium, in another to annul pain, and in the third to arrest degenerative processes obtains. The work of Finsen, experimental, and clinical, would seem to have conclusively settled this question. His record of cures in lupus vulgaris stands unparalleled and the results obtained were due to the intense chemical activities of the short and high frequency waves found in the ultra-violet region. To what portion of the ultra-violet region is the bactericidal effect due, and is it a primary or a secondary effect due to the reaction established in the tissues?

Two physicists, Bernard and Morgan, in connection with Dr. Allan Macfayden,* at whose suggestion the researches were undertaken, have conducted a series of scientific experiments, which so far as they go give us solid ground on which to stand. The well-known action of the higher and shorter frequencies of light vibrations, or light without heat to destroy micro-organisms without the body, is axiomatic. "This point was first covered by the experiments and verified at every turn. That organisms inside of the living body were destructively acted upon by light vibrations was regarded as a matter of considerable doubt. Just here it may be well to note in passing that the bactericidal action attributed to radio-active substances, to the X-ray, to high frequency currents or to other forms of electricity, unless in the polar action of the continuous current, anodal, by reason of its intense acidity and free oxygen, cannot in any instance be regarded as an immediate lethal effect upon the micro-organisms within the tissues, but rather as an inhibitory action, while the reaction established in the tissues, through the local or general expenditure of one or the other forms of energy, renders them an unfit habitation for living micro-organisms. It becomes simply a question of the survival of the fittest.

By their experiments Bernard and Morgan found that light was powerless to destroy bacteria in those cases where its rays were made to pass through any organic substance before impinging upon the bacteria and even the thinnest film of agar served to protect the bacterial cultures.

An automatic arc was used, the beam of light passing

*The Physical Factors in Phototherapy. By J. E. Bernard and H. D. R. Morgan. British Medical Journal, November 14, 1903.

through a metal cylinder through which water constantly circulated to eliminate heat and which was closed at each end with a disk of quartz. An agar plate was thickly inoculated with an active culture of *bacillus coli communis* and exposed to the light directly after inoculation and then incubated for twenty-four hours or longer at 37° C. The light was only permitted to fall on a portion of the plate, in order that the organisms should grow naturally on the other part and thus serve as a control. A current of seven amperes was used at a distance of 10 cm. from the arc.

In eleven seconds, the comparative number of surface colonies was greatly reduced, but those in the depths were unaffected. After an exposure of two hours and under the same conditions, the deep colonies were still unaffected. Again a portion of the human skin, in one instance the cortical layer, in another the subcutaneous cellular tissue, was stretched over the quartz disk of the apparatus, covering it entirely. An active culture of *bacillus coli communis* was then placed by means of a sterilized brush, upon an agar plate; this in turn was placed so that the light from the arc fell directly upon it after passing through the cooling chamber and the human skin. After a two hours' exposure no effect was produced on the bacilli, as on incubating the plate at 37° C. for twenty-four hours, the resulting growth was found to be equally vigorous over the entire surface of the plate.

The experiment was repeated both with a living and with a dead frog's foot. The light passing at the side of the frog's foot produced a destruction of almost all of the surface bacilli, while those protected by the semi-transparent webbing of the foot grew normally.

This led to the conclusion that the bactericidal rays being non-penetrative, the therapeutic effects of light might possibly be due to the reaction produced in the tissues by the light rather than by the direct bactericidal action of the rays themselves.

A series of experiments were then made to differentiate, if possible, between the rays or rates of vibration which are bactericidal, and the rays or rates of vibration which excite a reaction in living tissue.

In order to discover the most active bactericidal rays, a continuous current hand-fed arc was used and the spectrum,

as transmitted by a spectroscope with quartz lenses and prisms, was allowed to fall on superficially inoculated plates. A subsidiary quartz lens of 18-inch focus was used to project the image of the arc on the slit of the spectroscope, thus obtaining the spectrum of carbon.

It was found that the bactericidal effect was entirely confined to the ultra-violet portion, as would be expected from its intense chemical activity. The bactericidal lines began at 2.5 cm. from the edge of the visible violet, and extended from that point for 1.8 cm. into the ultra-violet. The photograph of the plate showed that the ultra-violet extended 1.5 cm, beyond this. No effect whatever was obtained with any other portion of the spectrum after two hours' exposure and with the slit of the spectroscope opened to an extent that would have been regarded as inadmissible in photography. The active bactericidal radiations have thus been accurately determined and lie in that portion of the spectrum between wave lengths 3287 and 2265, or in about the middle third of the ultra-violet region. Neither the extreme ultra-violet nor those nearest to the visible violet region appeared to be active. The affected portion of the bactericidal plates corresponded to a photograph taken of this portion of the spectrum, and it was possible to identify the nearly sterile lines on the plate with those known to exist in the ultra-violet spectrum of carbon.

The conclusion is therefore reached that relatively the action of the other portions of the spectrum is negligible compared with the activity of this portion, although when using white light it is possible that there is a slight action extending over the whole spectrum. This conclusion affords, then, a physical basis for similarity of therapeutic effect from widely different adjustments of arc light mechanisms, giving good values in white light, but at the same time it substantiates the use of mechanisms arranged to give the maximum of the short high-frequency vibrations or ultra-violet radiations.

A third series of experiments were then made to determine which rays were active in exciting reaction on the part of the tissues. These, while suggestive, are not yet regarded as conclusive.

The shaved skin of a rabbit, anæsthetized to secure absolute quiet, was subjected to the spectrum, with the same spec-

troscopic arrangement as before, and no effect whatever was produced after an exposure of two and three quarter hours, with a current of 25 amperes. Guinea-pigs, white rats, frogs, and even a human arm were similarly subjected to the same spectrum, but with absolutely no evidence of tissue reaction whatever.

An additional experiment seemed to show that the rays exciting this reaction exist somewhere in the ultra-violet region. A rabbit shaven on both sides of its body was subjected to the action of the light (25 amperes of current) passing through the water-circulating apparatus. Contact was made with the quartz disk on one side for five minutes. Then the other side was exposed in the same fashion, save that a sheet of glass was inserted between the water cooling apparatus and the skin. The second exposure lasted an hour, and was made with a current of 25 amperes. On the following morning, on the side exposed to the rays through glass for an hour, absolutely no effect had been produced on the skin, while on the side exposed but five minutes through quartz and without the intervention of glass, there was a well-marked redness.

This, the reader has clearly substantiated in the therapeutic uses of apparatus arranged with (1) glass lenses, (2) quartz lenses, and also in experiments made upon culture plates, the bactericidal effect being active with the quartz, absent with the glass. The well-known transparency of quartz to the extremely short and high-frequency vibrations of light, ultra-violet, and their loss or absorption upon the interposition of glass, accounts for the results obtained both experimentally and therapeutically.

All rays of the spectrum, save the greater part of the ultra-violet, readily penetrate glass, and any effect obtained with apparatus containing lenses or globes of glass is evidently due to the feeble penetration of a few radiations on the extreme edge of the violet as it merges into the ultra-violet region. To obtain the maximum effect of ultra-violet radiations is to secure the maximum result in the treatment of such pathologies as lupus vulgaris, as has been done by Finsen.

It is then clearly proven that the rays which excite tissue reaction are to be found in the ultra-violet region, but it is not yet accurately determined in just what portion of the ultra-violet spectrum they are located.

Quartz transmits the bactericidal radiations without any absorption, but quartz used in connection with water-cooling apparatus is much less active, as a part of the radiations are absorbed by the water. This absorption may be general rather than selective, and probably is. Still, the best therapeutic effect has been obtained by the reader from using the source of light; (1) in general conditions all the radiant energies of the arc, (2) in local lesions direct from the arc through a compressing lens of quartz only.

When the rays which excite tissue reaction are exactly located in the spectrum, now that the bactericidal region is definitely known, it will be possible to have light mechanisms so arranged as to give the maximum effect, in other words, it will be a question of administering the active principle of light vibrations, so to speak, is now done with drugs.

This work of Bernard and Morgan, although substantiating the work of Finsen and many other observers, is the first to definitely locate the active radiations, and will go far towards placing phototherapy on an absolutely scientific basis, as against its somewhat empirical use as practised to-day.

Equally interesting and valuable is the work done by Pisani on the biological action of electric light upon muscular action. The results obtained by him, although working in an entirely different manner, tend in the same direction as those of Bernard and Morgan, and are corroborative of the opinion held to-day both by the physicist and the physician that it is the chemical rays which have the power to penetrate deeply and awaken reaction in the tissues, and are therefore capable of establishing therapeutic effect.

According to Rieger the chemical rays produce motor excitation in the nervous system, while Parville has found that excitations of the peripheral nerves are also produced by them. Gerhard, Pluger, Cazenave, Ratier, Furie, Fossangrève, Aubinois have all demonstrated that light has a direct action on the muscles and nerves. From baths of electric light Colombo found that the chemical radiations exert a stimulating action on all functions of the skin through the bio-chemic action which they awake in the tissues. Because of all these facts, Pisani was led to undertake a series of experiments to find out if blue light could have any biological action upon muscular work. While the fact of muscular excitation by light has been

recognized these are the first experiments made to demonstrate its influence upon muscular labor.

Pisani's experiments were made at the Institute of Physiology of the Royal University, Naples.* They were made in the dark chamber devoted to phototherapy and with the ergograph of Mosso. The subject chosen for all the experiments was thirty years of age in perfect health, of normal structure of skeleton, and muscles but little used to muscular labor. Therefore the weight used in all the experiments was but one kilogram. The source of light was furnished by lamps in blue, white, and red glass of 50 candle-power each, and each was provided with a metallic reflector on a universal joint. The time was regulated by a metronome, registering 84 beats a minute. The conditions of the subject were kept the same as far as possible every day. Eight tests a day, in two series of four each, were made, an interval of twenty minutes being allowed for rest in the open air between the two series, and also a five-minutes' rest between every two tests. Ergographic tracings, showing exactly the amount of work done by a normal muscle unacted upon by any extraneous influence were first made. Every test made under the influence of light was also accompanied by its ergographic tracing.

As a result of these experiments it was found that (1) blue electric light exerts a favorable action upon muscular work in increasing energy and resistance; (2) that the favorable action upon muscular work is explained by the influence upon the muscles in activity which light exerts upon the muscles themselves; (3) the favorable action is not, in every case, proportional to the time in which blue light has acted on the muscles. As to this, one can say that muscular work is positively increased by exposure to blue light during fifteen or twenty minutes, but with longer exposures (an hour) there is a rapid increase of muscular activity which speedily fails. This was beautifully shown in the tracing made after the hour's exposure; (4) the effects of blue light upon muscular work diminish in proportion to the time elapsed since the exposure; (5) the action of blue light upon work probably corresponds to the speed of material exchange in the muscles, which are the true organs

* *L'Action Biologique de la Luminière Electrique, Sur le Travail Musculaire.*
Par le Dr. R. Pisani. *Revue Internationale d'Electrothérapie et de Radiographie*,
Octobre, 1903.

of motion, since the action of the colors of the spectrum upon nervous excitation is not yet surely proven; (6) action upon muscular work is an attribute of blue light and not that of other colors of the spectrum, since white has no influence, and red depresses rather than stimulates muscular work.

Pisani's work is accompanied by ergograms, each test, showing the effect of blue light, red light, and the absence of effect from white light.

These ergograms are most graphic illustrations not only of the number of muscular contractions but of the change in amplitude as well. In the test for control the amount lifted in the first test was 1736 kilograms; in the second, when the muscles had not recovered from the fatigue of the first, but 1455 kilograms. On exposing the arm to a beam of light from the blue lamp the work done for the test, with muscles already fatigued by the two tests for control, was 1848 kilograms, an increase of 112 kilograms over the normal.

These experiments have not only a value in demonstrating the power of light upon muscular labor, but are extremely suggestive as well. The depressing influence of red light upon muscular activity, taken in connection with its well-known stimulating effect upon the nervous system, through its influence upon circulation, as well as the stimulating effect of blue light upon muscular work, taken in connection with the sedative or depressing effect of blue light on the nervous system, are conditions to be substantiated by further experiments.

Another thing to bear in mind is this, that while from the middle third of the ultra-violet region proceed the bactericidal radiations, and from the ultra-violet region those rays which excite reaction in the tissues, the experiments of Pisani place the rays which influence muscular activity in the blue violet region, for the intervention of the glass globe effectually shielded the subject from the ultra-violet rays. At the same time the blue glass shielded from the longer and lower frequencies. The part of the spectrum used is possessed of marked actinic properties, as photography constantly demonstrates. Were it not so, all plant and animal life would suffer, for the ultra-violet rays, or the extreme chemical activities from the sun, are largely absorbed in transit from the sun to the earth. The longer and lower frequencies, yet relatively

high and short, of the blue and violet end of the spectrum are abundant in sunlight and easily penetrate glass.

In the determination of the action of these physical factors, or parts of the spectrum, a great step in advance has been made.

The physiologic action of light so far, then, as known, proceeds from the calorific rays which clinically seem to exercise a profound influence on the nerves of the skin, and the actinic rays which, as has been shown, have an action upon bacteria, upon tissue reaction, and upon muscular activity. When the entire range of the spectrum has been studied experimentally, either by actual test of each part or by exclusion, light vibrations can be precisely dosed and measured as is possible now not only with drugs butt with some physical agents as well—electricity, for example.

The spectrum of iron and cadmium would seem to be twice as rich in ultra-violet rays as those of carbon or carbon charged with silver, and almost twice as rich as aluminum, for with exactly the same conditions as to nature and position of the hanging drop of culture, amount of current, and distance from the arc, thirty minutes were required with a carbon arc to destroy the bacilli; thirty minutes for the carbon charged with silver; fifteen minutes for an iron arc; fifteen minutes for cadmium, and twenty-five minutes for aluminum. Therefore, to secure the most intense bactericidal action, iron or cadmium electrodes are preferable, but as the radiations which excite tissue change are not definitely located in the same part of the ultra-violet region, it may be that a carbon arc giving a less intense ultra-violet field, *i. e.*, less chemically irritant, is better for the purpose of exciting tissue reaction. Clinically this would seem to be the case both with carbon and iron-cored or iron-mixed carbon electrodes, were it not that the mechanisms provided with them were also lamps of greater amperage, and the better effect may have been solely due to the greater quantity of light. Time prevents any extensive consideration of the well-known physiological action of light or its mode of action. Every form of light—sun, incandescent, and electric arc—has a profound influence upon metabolism, both that of plants and animal life. The vibrations of the thermal rays have a profound influence upon the nerves of the skin. In the incandescent light, so commonly

used therapeutically, it is not only the heat radiations or the lower and, to the eye, invisible radiations, however, which are responsible for physiologic action, but the higher and shorter vibrations of the blue part of the spectrum also. These, by reason of their physical properties, high frequency, and short length, have great penetrability, and are therefore profoundly implicated in the establishment of normal tissue change. The yellow rays seem to be of value in plant growth, may they not also influence animal development? Red light influences the aroma, while ultra-violet increases flowering. Concentrated sunlight destroys plant cells, shriveling up the protoplasm. This must be because of the intense activity of the high and short wave lengths or the chemical radiations of light. An animal eliminates more carbon dioxid under the influence of light than when confined in the dark. The same is true of hibernating animals. When kept equally quiet, starving animals lose less weight at night than during an equal number of daylight hours.

A crab, for example, if coated with transparent varnish, which permits the influence of light vibrations to be felt, is unaffected, but if coated with dark varnish, impenetrable to light, it quickly dies. Oxidation goes on much more rapidly in living tissues on exposure to light than in the dark. The action of the sweat glands is increased both by the thermal and by the chemical radiations. Bodily temperature is increased especially by the former. The result is an increased stimuli to the heart, brain, and every organ of the body, and increased metabolic activity. The increased production of Co_2 indicates an increased consumption of carbons and hydrocarbons. There is also increased oxidation of proteids which raises the temperature of the blood-stream.

Cutaneous vessels are dilated not only as the result of the heat rays but of the chemical rays as well. Finsen established a dilatation of the capillary blood-vessels of his arm from exposure to ultra-violet rays, which lasted for six months, while the pigmentation, a chemical change in the coloring matter of the skin, lasted for two months. By the action upon the capillaries there results an increased activity of the heart with acceleration of the blood-stream.

Again, all this tends to increased metabolism. The over-filling of cutaneous vessels by the action of sufficiently concentrated radiant energy, a sun bath or a bath of incandescent lamps, for example, diverts blood from the interior of the body, and as the superficial vessels are estimated to contain from one-half to one-third of the blood supply, the rationale of the action of a radiant energy bath becomes apparent. There results a draining, as it were, of the internal organs, brain, liver, spleen, kidneys, and stomach, becoming anæmic.

By the establishment of a temporary cerebral anæmia, re-

freshing sleep ensues with its profound influence for good upon the nervous system. It has been shown that the chemical rays influence muscular work, while their influence upon the nervous system is one of common observance. By their intense activity, as in the ultra-violet region, when concentrated upon a part, irritation, congestion, and even inflammation results, and this reaction established is active in the production of therapeutic effect.

The living body may be regarded as a transformer of energy and life, considered in its chemical or physical processes, is reduced simply to a modality of movement; or more correctly, to an ensemble of movements, various in nature and amount, which cannot be created nor destroyed, but are the result of external or internal forces, that is to say, derived from chemical cellular metamorphoses transformed by the nervous system to minister to the manifestations of life.*

As physiological processes are altered by the action of muscular vibrations, raising or depressing the heart's action, altering the caliber of the arterioles and modifying nutrition, it is only reasonable to assume that other vibratory manifestations should act in the same way. A correct interpretation of this conception of Adam's would mean that each tone ought to supply an antidote for some special pathological lesion. Be that as it may, the action of heat and cold, as well as that of many other physical agents may find its explanation in the modifying influence of these agents; their vibrations, in a word, upon the disturbed vibratory action of the tissues. And not the action of physical agents, but chemical ones as well may be so explained. Their molecular vibration may influence the vibratory action of some special tissue, as, for example, the vibration of strychnia molecules may find a response in the vibrations of anterior ganglion cells and so stimulate them.† Just so may the varying rates of vibration, represented by the varying frequencies or wave lengths of light, influence molecular vibrations both in physiologic and pathologic processes, serving in the one instance to maintain normal physiological activity, and in the other tending to the modification of the complete control of pathological processes.

The need is for the selection of a rate of vibration or frequency of light waves, attuned to the special condition of disease, and then by exact control and measurement to so manipulate them as to adapt them to the special vibratory disturbances of the organism. To that end scientific experimental work of the nature of Bernard and Morgan and of Pisani is welcomed.

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* Quimball. *The Journal of Physical Therapeutics*, October 15, 1900.

† W. S. Hedley. *The Journal of Physical Therapeutics*, October 15, 1900.

THE VALUE OF MECHANICAL VIBRATION AS AN ADJUNCT TO ELECTRO-THERAPY.*

BY MAURICE F. PILGRIM, A. B., M. D., NEW YORK CITY.

The attention of this Association will be solicited for a few minutes only to a consideration of but two of the several points of advantage that may be enjoyed by the electro-therapist from the employment of mechanical vibration as an adjunct to his armamentarium. In that brief time it will be obviously impossible to enter upon the discussion of any of the theoretical considerations that might legitimately arise in connection with the subject. All that is now sought is to point out to my colleagues with the fewest words and in the briefest time possible, the indications for the employment of the valuable physical agent that constitutes the title of this paper, and bespeak for it their consideration and investigation.

Probably the two most imperative objects to be attained in the successful treatment of many diseases, are also among the most difficult of accomplishment, viz.:

- 1st. Relaxation of muscular contractures; and
- 2d. Efficient performance of the processes of absorption and elimination through functionation of the lymphatics.

It is well recognized by physiologists that muscular tissues respond to and are controlled by the impulse transmitted to them by the nerves which lie imbedded in their structure. If, therefore, a nerve becomes sufficiently irritated through traumatism, or reflexly from a diseased viscus, it communicates to the muscle within which it lies the irritant impulse which causes it to contract. The degree of muscular contraction thus set up will be measured by the severity of the nerve irritation or disturbance communicated to it.

In the contraction thus induced the muscle through the pressure which it exerts upon it, returns to the nerve communicating the impulse, an added amount of the same irritating quality originally received from it. Thus nerve acting upon muscle, and muscle upon nerve in return, establish by mutual reaction what has been very properly denominated as "vicious circle." If in the case of the deep muscles of the spine this action be

* Read at the Thirteenth Annual Meeting of the American Electro-Therapeutic Association at Atlantic City, September 24, 1903.

long continued, there must ensue to those thus acted upon, either hypertrophy through irritation of the trophic nerves which excite undue cell activity; or atrophy because of the inhibition of a normal blood flow to the part, or through enervation of the nerves governing its nutrition. In either case it is apparent that the application of the time-honored principle of "removing the cause," must largely depend upon our success in securing the relaxation of the contracted muscle. When it is recalled that along the cord, between the transverse processes of the various vertebræ, lie the spinal nerves in a mass of muscular tissue which preside over the vasomotors and through their communications with the sympathetics, control the functioning of the viscera of the body, it is apparent how serious and far-reaching the consequences of muscular contraction in these parts may become. It can readily be seen that not only the circulation to the cord itself but to every part of the organism, as well as the nutrition of the viscera, may from this cause become seriously compromised. We shall be unsuccessful in our endeavors to cure a diseased organ, no matter what agent may be employed for the purpose, so long as our inability to control the circulation and nutrition of the affected organ continues. The great, imperative, all-embracing desideratum, therefore, is the prompt relaxation of the contracture!

For this purpose, gentlemen, the employment of mechanical vibration applied deeply over the contracted muscle, is of priceless worth. It has withstood successfully every test that a somewhat extensive experience in this sort of work has put upon it. It is offered not as a succedaneum to electricity, but as a precious adjunct which, by quickly removing the obstruction from the pathway toward cure, renders possible and more sure the curative action of the electric current whose potency is now coming to be so generally recognized. It does not rival, but most efficiently and admirably supplements and co-operates with, electricity in the prompt accomplishment of the desirable object named, and as such it is cordially commended to your consideration.

Respecting the second indication for its use, it is well known that all parts of the body, beginning with the head and neck, are plentifully supplied with lymphatic vessels which pass at some point of their course through the lymphatic glands.

these glands are numerous along the great vessels of the abdomen, thorax, neck, in the mesentery, axilla and inguinal region, being also found in the popliteal space and as far down the arm as the elbow. In addition to being the birthplace of the lymphocytes and the temporary reservoirs for lymph, they also drain the tissues adjacent to them and convey waste matter into the proper channels en route to the points of elimination. Important as are their functions, physiologists recognized their somewhat sluggish natural action and their extreme liability to become overloaded with waste or deleterious matter and thus inefficiently discharge their allotted and important functions. Experience has proven, however, that these organs are highly responsive to stimulation and under such impetus the process of absorption may be greatly accelerated. Mechanical vibration when applied to the lymphatics and the excretory organs, never fails to markedly enhance the process of absorption and elimination. This is a fact that has received almost daily demonstration during the past twelve months. In the cases of cancer treated within the last year by the X-rays, would seem to be reasonably certain that in several cases the results have not only been more prompt but also more uninterruptedly favorable, when treatment of the lymphatics by means of mechanical vibration was employed adjunctively. It is so treated, stimulation of the lymphatics by this means rendered possible a more rapid disintegration of the morbid growth without the usual development of toxic symptoms, which, happily, as already stated, did not appear in the slightest degree or in a single instance.

Finally, gentlemen, because these results if true are too valuable and precious to be kept "hid under a bushel," is my excuse for interposing upon your time to-day. That by your individual experimentation along the lines indicated, the truth of these propositions may become the better established, generally known, and utilized for the greater amelioration and relief of those who suffer, is the final plea of this paper.



LOBAR PNEUMONIA A SECONDARY DISEASE, PREVENTABLE AND CONTROLLABLE, BY PHYSICAL AND DIETETIC METHODS.*

BY MORRIS W. BRINKMANN, A. B., M. D., NEW YORK.

The unusually good and prompt results obtained by the writer in the treatment of a number of patients suffering from so-called acute inflammatory troubles of the lung, have caused the publication of the following and are justification for adding a mite to the flood of literature on similar subjects.

The high mortality of so-called acute inflammatory processes in lung tissue is so well-known and appreciated that statistical proof is unnecessary. As a result of this high mortality, treatments for inflammatory lung conditions are in many cases of an extreme character, many medical men of high authority going to the point of advising blood-letting in certain stages, as a wise and desirable procedure, although it is well-known that death in this condition is nearly always from asthenia or exhaustion.

The solution and only solution of this problem lies in a direction where we can absolutely influence the pneumonic process going on in the patient.

The absence only of a proper grasp and understanding of the nature of the processes under consideration can explain the diversity of the treatments so far employed. We have among other theories the bacterial cause, the so-called pneumococcus of Friedlander. This theory has not influenced pneumonia therapeutics to a degree worthy of consideration. As a matter of fact, this coccus has been found in individuals under circumstances where pneumonia did not exist, showing conclusively that in the absence of other conditions necessary for the disease to develop the poor coccus is an inoffensive creature. As the microbial theory has not influenced the therapeutic and does not accurately explain the associated conditions present, we can safely call this theory an academic fallacy. Of older date but having still many adherents is the belief that cold is an important factor in inducing pneumonia. The latter theory has at least influenced the treatment sufficiently to demonstrate that the minds of physicians and laymen were dwelling upon it as a

* Read before the Clinical Society of the New York School of Physical Therapeutics, Friday evening, December 18, 1893.

matter of serious importance. This is shown by the close room, thoroughly warm; hot and stimulating drinks; heat to the surface and more especially the chest, either dry in the form of the cotton lined oil-skin jacket, or moist as a poultice, etc.

Neither of the foregoing theories are satisfactory in their explanation as to (1) how and (2) why the material contained in the air sacs reached its habitat. (3) As to the rapidity of the respiration it is insufficient as will be later shown. (4) As to the existence of fever or its disappearance regardless of the existence or absence of exudate in the lung. (Observed frequently and by many.) (5) As to the number of lung lobes involved and (6) finally as to the time of development and disappearance of inflammation; all these are equally matters of speculation; when either the theory of the pneumococcus or again that of cold are assumed as causes for pneumonia.

All treatments known to the writer are purely symptomatic. In detail: pain, fever, expectoration, circulation, respiration. weakness, loss of appetite, etc., *ad infinitum*, are each of them treated as individual conditions. No writer or therapist has, I believe, made any claim for a measure or measures which has or would influence the pneumonic process. I should perhaps except those laboring in the serum field. What our hopes may be in this direction experience best demonstrates.

As to the pneumococcic serum. In the July number of the *Archives of Pediatrics*, is recorded another failure. Morse records lack of results as to duration of disease, temperature uninfluenced, neither pulse nor respiration affected, physical condition of the lung not at all changed. There were complications in a percentage higher than ordinary. The serum was apparently valueless in all respects.

Any view of the subject which promises from theoretical reasons a certain means of assisting the patient in this condition has value. When, however, results of a uniformly favorable character by the employment of simple and harmless measures restore the sufferer with promptness to his natural condition; no one concerned in the treatment of such patients is justified in ignoring either the theory or facts involved.

No attack upon the theory proposed can have any value unless it is based upon experience after actual treatment of a series of cases in which the principles involved are carried out in their entirety.

Let us take the following as the type of inflammatory lung

processes of an acute character as ordinarily seen. Chilliness, or a pronounced chill, mostly associated with pain in the chest at or near the nipple region, ushers in the process; then come fever, cough, expectoration more or less stained, varying from pale pink to deep prune juice color, breathing accelerated and pulse rate rapid. Aside from the physical signs these are the so-called classical symptoms and as far as they go into the matter are correct. In the examination of a number of sufferers having all the symptoms named above, other conditions were invariably found to be present, so important indeed that the writer has become convinced that acute pneumonia is a secondary condition and that the lung condition is consequent and is therefore not of prime importance.

To particularize the conditions noted were great distention of either stomach or intestines or both together, with or without enlargement of the liver or spleen or both. The importance of these conditions will be seen in considering the etiology of pneumonia after studying the anatomical and physiological arrangement of the respiratory apparatus.

The lungs are limited in their movements in all directions by certain boundaries. These boundaries vary within certain limits both in health and disease. The full range of the inspiratory effort requires that no impediment shall be offered to the expanding lung. Any obstacle to full expansion of the lung is an abnormal state of the respiratory and also the circulatory mechanism. When the obstacle is slight the manifestations are correspondingly slight, and in proportion as the obstacles are greater so do the symptoms in the patient indicate this.

The vertebral column, ribs, and sternum constitute the bony walls for the respiratory mechanism and are all of them connected with ligaments, cartilages, muscles and, membranes to form a framework capable of varying the contained cubic capacity. (1) The upper limit of the thorax is the neck and is very nearly a fixed boundary. (2) The variation in cubic capacity of the chest, produced by the rotation of the ribs on their axes, and the elevation of the ribs; is certainly a factor, not to an extent to be of the same importance as the following. (3) The level of the lower opening of the thorax, however, can undergo great changes, in this way greatly influencing the air capacity of the thorax, which means of course the lungs. The lower opening of the thorax is bounded by the diaphragm. This muscle is also the roof of the abdomen. When, therefore,

the roof of the abdomen is pressed upwards the floor of the thorax is also pressed upwards. Whether this displacement upwards must produce changes in the respiration we shall at once be able to demonstrate.

The amount of air which the average adult inspires is 28 cu. in. per respiration, and this is done we will assume 20 times per minute, or 560 cu. in. If for any cause the ability to take in air is reduced, the necessity for it is not removed and the individual adapts himself by varying the rate; thus if 7 cu. in. per respiration are deficient this is equivalent to 1-4 ($7 \times 20 = 140$ cu. in. deficiency). In order to make up this deficiency, he respire 1-4 more times than under normal conditions, that is, $20 + 5 = 25$ times per minute, so that he now breathes 25 times per minute. In other words, the individual can compensate for his deficiency by increasing the number of respirations.

The limit of compensation is, however, reached when the individual can no longer make a sufficient number of respirations to overcome the deficiency in cu. in. per respiration.

The air entering the lungs at each inspiration and leaving with expiration the so-called (1) tidal air—is in contradistinction to the air remaining in the lungs in excess of this so-called (2) reserve and (3) residual air.

The difficulty in breathing being approximately developed as follows: When the capacity of the thorax is so reduced that the tidal air no longer can be held, the reserve air must do full duty, necessitating labored respiration. Upon still greater deficiency of air capacity through lack of space, the residual air is mechanically forced out and gasping respiration results.

When the capacity of the chest cavity is so reduced that the necessary amount of residual air is encroached upon, the pneumatic support for the lung structure is removed to the same extent, and the conditions necessary for the proper inflation of the lungs are removed, as is also the support of the great mass of blood-vessels (capillaries) carrying the blood from the right side of the heart through the lungs, to the left side of the heart.

Respiration is carried on, therefore, under difficulties proportionate to the displacement of the diaphragm upwards; from simple increase of frequency per minute to finally a feeble, shallow, rapid gasp. Up to this point, we have not taken up the subject of the inflammatory exudate.

THE THERAPEUTICS OF THE CONTINUOUS CURRENT.

BY MARGARET A. CLEAVES, M. D.

CHAPTER II. (*Continued.*)*The Current: Its Effects and Physiological Action.*

There still remains for consideration *the fourth action or the local increase of temperature produced by the current* before taking up its physiological action. In dead tissues and practically in tissues isolated by excision or ligature, Stewart found it "a purely physical problem to calculate the quantity of heat evolved by a given current in a given time. It varies directly as the square of the current, the first power of the resistance and the time, when the energy of the current is all transformed into heat. When a part of the energy is employed in chemical decomposition as is always the case in electrolysis of animal tissues, the heat will be less by a corresponding amount. The rise of heat produced in an isolated tissue by a given current in a given time, chemical decomposition being left out of account, will vary directly as its resistance, inversely as its capacity for heat, and inversely as the loss by radiation, conduction, etc. When the stationary temperature has once been attained, the heat loss will cease to have any influence, and the excess of temperature will depend only on resistance and capacity. For example, the specific heat of nerve and muscle being taken as about equal, the capacity of a given length of the sciatic nerve of a frog will be to that of the same length of the gastrocnemius muscle approximately as their mean sections. Their resistances will bear the same proportion. The rise of temperature will therefore be universally as the square of the mean section for a given current strength. Thus a current which may not raise the temperature of the muscle by more than a fraction of a degree, may shrivel up the nerve. Those facts based on physical laws, Stewart proved by experiments in dead tissue. In living tissue there is the circulation of the blood to take into account. This tends to prevent the local rise of temperature. The resistance of the tissues is so great as compared with the internal resistance of the chemical generator, or adapter connected with the street current, that nearly the whole heat production must be between the

electrodes. If one electrode contact is small compared with the other the heat production must be correspondingly increased in its neighborhood. In this fact is found the reason for the avoidance of small surface or skin contacts, and therefore the use of an ordinary sponge covered disk or hand electrode for the indifferent contact in intra-urethral and intra-uterine applications as practised by many physicians, is not only utterly unscientific, minimizing results, but fraught with an element of danger, both by reason of the heat generated at the site of contact and by the great current density, when current distribution instead is required. It is a physiological fact that a gland like the liver is capable of great heat production. Bearing this in mind as well as the heat producing effects of the current, Stewart very pertinently inquired, whether it were possible that in an ordinary gynecological electrolysis (intra-uterine application for an endometritis for example), with a pressure of from 30 to 40 volts, working through a resistance of 300 ohms, the chemical action of the current concentrated within two or three hundred grams of tissue could fail of the production of heat. To demonstrate this, experiments were made upon (1) a cat just dead with the cathode in the vagina by the natural opening, and the anode, much the larger contact, over the uterus. A thermometer was placed within the vagina through an incision. In three minutes with a current of thirty-five milliamperes the vaginal temperature had risen 1.8° . On opening the current the temperature rapidly dropped 1.7° and on closing with the vaginal electrode the anode instead of the cathode as before, it again rose during a four-minute application 1.8° . During the passage of the current it remained stationary, but fell rapidly to a little below its former height when the current was withdrawn, as the animal was still cooling. But in this instance the circulation was no longer active, therefore a live rabbit was placed under the influence of chloroform, the skin of the abdomen shaved and a large disk electrode covered with cotton wool moistened with warm normal saline solution was adjusted to the shaven surface, while a tubular electrode carrying a thermometer in its lumen, was introduced into the vagina. At first the intra-vaginal electrode was the anode, then another series was taken with the cathode in the vagina. A current of thirty-five milliamperes was passed. The animal was kept as warm as possible by covering with cotton wool, still there was a slow progressive cooling which was regarded as a disturbing factor. Despite this fact, however, there was no question of an appreciable rise of temperature when the current was passing. In the first half a minute there was an increase of $.45^{\circ}$, which in the next seven and one-half minutes was held at $.41^{\circ}$ above the initial temperature. On opening the current for sixteen minutes there was a gradual drop of

1.01°. On closing the current the temperature again rose in seven minutes .8°, but on opening the current gradually dropped .8° in the next seven minutes. With the cathode there was a steady increase of .5° for the first five minutes, with a decline for the next four minutes of .3° when the current was opened, and there was in the next four minutes a drop of .25°.

Thus it will be seen that the limit is soon reached and the range not very wide, for as is well known the higher the temperature of a part may be, the more heat does it part with to blood cooler than itself.

"The development of heat is proportional to the square of the current and a current of 150 milliamperes would produce a heating effect twenty-five times as great as the thirty milliamperes of the experiment under similar conditions."

But with the circulation intact, there would be nothing like the theoretical increase of temperature. If the extreme rise were .5° with five times the current, say one hundred and fifty milliamperes, against thirty milliamperes, the actual rise in temperature in the living subject would not be twenty-five times as great. The cooling dependent upon the circulation of the blood must be reckoned with. On the other hand the heat generated in the tissue elements where the action is most intense cannot be estimated by the rough test of a thermometer in the vagina, and it is possible that one of the physical effects of electrolysis by a strong current may be a local heat coagulation of some of the proteids of the tissues.

With such an effect the result would be that of local death and consequent absorption. But the increase of temperature might not be sufficient for this, but sufficient to give rise to a "local fever," so to speak, which, while it lasted, would unquestionably induce increased metabolic activity. Or, if of long enough continuance, the way would be prepared for fatty degeneration. The chemical activity of the products of electrolysis, at the cathode the alkalies, and at the anode the acids, favored by the normal temperature will be still further increased by the increase in temperature.

There was no rise in temperature observable in the rectum nor in the mouth in these experiments, eliminating the influence of muscular contractions. Resistance is lowered by the action of the heat, for example, warm water has less resistivity than cold water, but the increase of temperature in an application of the current therapeutically would not be sufficient to account for more than a small part of the progressive increase in the current so often noticed in therapeutic applications.

(To be concluded.)

Editorial.

HIGH POTENTIAL AND HIGH FREQUENCY CURRENTS.

THE introduction of the X-ray in therapeutics has placed in the hands of a large number of physicians, apparatus for producing currents of high potential, and adaptable to the treatment of a large number of diseases for which electricity has not been used heretofore, except by trained electro-therapeutists. Some have adopted the static machine, and others the variously constructed Rumkorff coils for this purpose. From both sources, currents of high potential are induced with frequencies varying with the character of interrupters employed. All currents have three qualities to be considered with reference to their therapeutic applications, as follows: amperage or quantity, potential or voltage, and frequency. The currents employed for the production of the Roentgen Ray possess the three qualities in varying ratios. The current of high potential, and relatively large quantity of the coil is dangerous to life when directly administered to the patient, and though rendered less so by high frequency, requires great caution in administration. The use of induction discharges, however, by the employment of vacuum tubes, is a safe method even with these currents.

When the static currents are employed the proportion or quantity of which is too small to present an element of danger under any circumstances, our method of administration, either by the employment of vacuum tubes, or direct metallic connection of the patient with the source of energy is permissible.

The disposition in this country at the present time to pre-empt the term "high-frequency" for the employment of vacuum tubes is fallacious and misleading, because it fails to recognize numerous other methods of administering high-frequency currents. While it is *par excellence* the most valuable and convenient method of administering the *coil* currents, it is not so available as the static wave-current, and of only relative value to other static high-frequency modalities.

Correctly speaking, the number of oscillations or alternations of electrical currents per second denotes their frequency. High-frequency cannot therefore be properly limited in its application to vacuum tubes, as shown above.

High-potential is the constantly associated condition with currents of high-frequency, and when the source of the current is a Rumkorff coil, an association with condensers or otherwise the potential is in reality the most valuable therapeutic agent, and may be administered safely regardless of the character of the interrupters, when the vacuum tubes are employed. With these however, the marked muscular contractions characteristic of the static current is not appreciable.

Another observation which must be considered in the employment of currents of high-frequency, as the rates of frequency are increased, the effects appear to be more superficial. In other words the currents of high-frequency are not so well adapted to treatment of deep-seated conditions. With the static currents, are produced marked and diffuse contractions, and the effects upon tissues deeply underlying the integument are valuable in proportion to the potential employed. As in mechanics speed is always produced at the expense of power, so frequency is produced at the expense of the potential. In other words, a potential which exerts itself in the production of numerous oscillations, other things being equal, is exerted at the expense of such potential. It is the potential of the current which gives it power to produce deep vibratory effects when administered from one side of the source of electrical energy, as in the employment of vacuum tubes and the static modalities.

Potential then is invaluable in the treatment of deeply-seated conditions and best results are obtained in such, especially in the inflammatory processes from currents of *slow* or *interrupted* frequency, while higher frequency seem to be indicated in the treatment of superficial skin affections and mucous surfaces.



THE LATE MAURICE FIESCHOR PILGRIM, M. D.

DR. MAURICE FIESCHOR PILGRIM.

DR. MAURICE F. PILGRIM was born at Cohansey, N. J., in January, 1856. Until fourteen years of age, he attended the local school and then began his studies at the Fort Edward Institute, of which Institution Dr. King was then President. After graduating from this school, he attended Williams and Mary College, Virginia, and graduated from Howard University both as Doctor of Pharmacy and Doctor of Medicine. He later took post-graduate courses at Mills College in Philadelphia and at the New York Post-Graduate Medical School and Hospital, and at Guy's Hospital, London.

Since the commencement of his medical career, Dr. Pilgrim practised in various towns and cities in this country and has always won the confidence of his fellows in his professional capacity wherever he has lived. He was for a time associate-editor of the *Refractionist*, a medical journal which was published in Boston, Mass.

The following we quote from a sketch by one who knew him well and has truthfully described his personal characteristics:

"He was a critical student of wide range and remarkable versatility, intelligently familiar with philosophy, theology, politics, literature, science and every department of his own profession. As a physician and specialist, his training was thorough, his intuition keen and true, and his successes were in many respects phenomenal. He was positive in opinions, and hospitable to new ideas; wholly loyal to the school of medicine in which he had been educated, but quick to welcome new methods if their merits could be demonstrated. Of shams, affectations, or falsities, he was severely intolerant—too outspoken to please everybody, but truthful, serious, and sincere to the core. He was loved and esteemed by those who knew him best and was a man of rare qualities of mind and sentiment. He was a fluent and forceful writer, author of a technical work on Mechanical Vibratory Stimulation, and many strikingly original articles on professional subjects."

One paper published in 1895 entitled "Is Glaucoma Curable Without Operation?" attracted a great deal of attention and established a tendency in the direction of curing this intractable disease. He also published another paper during the same year: "Shall Opticians Attempt to Fit Glasses?" Re-

cently, he had devoted much of his time to the study of psychiatry upon which he had written several valuable papers which had attracted favorable comment.

Dr. Pilgrim's first paper on psychiatry, entitled "The Relations of Psychic Suggestion to Electro-Therapeutics," was read at the annual meeting of the American Electro-Therapeutic Association on September 14, 1902. This paper was a strong presentation of the value of psychic suggestion as an adjunct in the treatment of disease and was accorded a cordial discussion by the Association. His last paper, entitled *The Vis Medicatrix Naturæ*, read before the Clinical Society of the New York School of Physical Therapeutics on July 19, 1903, and published in the *JOURNAL OF ADVANCED THERAPEUTICS* of October, was considered by the author as his best production. It presented in a clear, concise, and practical manner his views upon the subject. In January, 1903, he was elected Professor of Psychiatry in the New York School of Physical Therapeutics, the chair which he held up to the time of his decease.

Dr. Pilgrim possessed rare qualities as a teacher and a knowledge of the scope of the subject possessed by few at the present time. As editor of the department of psychiatry in this *JOURNAL*, he has conducted his department with ability, showing a breadth and earnestness found only in those who appreciate the importance of their special work. Dr. Pilgrim possessed rare qualities of concentration and a power of expression, clear and concise, which well qualified him for the work he had in hand.

During the past year, he published a work on Vibratory Stimulation, the first work of the kind published, which has received a well-deserved recognition from the medical press and the profession. He had in preparation a work on Psychiatry, which the writer had supposed was ready for publication, but careful search of his effects and manuscripts has failed to discover it. This is to be regretted by all who are familiar with his writings, for a work, at this time, from his conception of the subject would have been a valuable contribution to medical literature.

His death has left but feelings of sorrow and regret from a large circle of friends and acquaintances who highly esteemed him. He was buried at Danville, Vt.

W. B. S.

Progress in Physical Therapeutics.

GYNECOLOGY AND APPLIED METALLIC ELECTROLYSIS.

BY G. BETTON MASSEY, M. D., PHILADELPHIA, PA.

The Treatment of Cancer by Mercuric Cataphoresis. By Amédée Granger, M. D., New Orleans Medical and Surgical Journal, December, 1903.

This paper was read by Dr. Granger before the Orleans Parish Medical Society, November 14, 1903, and included a full consideration of the subject, a complete list of all cases treated by the originator of the method (the Editor of this Department of the JOURNAL) brought down to a recent date, and prepared specially for this paper, and a report of a case treated by Dr. Granger himself.

This patient, who is sixty years old, first noticed the growth on her lower eyelid about four years ago. She has been under the treatment of several physicians during that time. For a period of six months ice was kept against the lid all day long. Later iodoform and aristol were dusted over the ulcer. On the 27th of September, 1902, the patient was exhibited before the Society by Dr. E. W. Jones, who had been using chlorate of potash, inclosed in a small muslin bag, and applied over the lid with adhesive plaster. The doctor stated that there was much pain, and the growth was increasing rapidly when he began the use of the chlorate of potash, two months before; that there was then (September 27, 1902) a marked improvement, little or no pain, and the growth was not one-third of the size it was a month before.

This improvement was only temporary; the patient continued to use the small bag for two months longer, when she discontinued and sought the advice of another physician, as the pain had returned and the ulceration was spreading anew. She remained under the latter physician's treatment without any benefit until September 22, 1903, when Dr. Granger first saw her. At that time the growth involved the inner canthus, the inner three-fourths of the lower eyelid, and was growing steadily. It was ulcerated, painful and hemorrhagic. The lower eyelid was tight and indurated, especially so about the inner canthus.

Dr. Granger succeeded in destroying the diseased area by three applications with the zinc-mercury points under cocaine anæsthesia. The current ranged from 5 to 10 ma. and the duration of the application from 5 to 13 minutes. The last application was made September 30. Two days later a tiny zone of sterilization could be seen in the sound tissue surround-



EPITHELIOMA OF LOWER EYELID (DR. GRANGER'S CASE)
TREATED BY MERCURIC CATAPHORESIS.

(Courtesy of New Orleans Medical and Surgical Journal, December, 1903.)

ing the area of necrosis; the latter had all sloughed off by October 11, leaving an excavation which was soon filled up by healthy granulation tissue.

Now there is no evidence of malignancy, the eyelid is not drawn as tight, the eyeball can be moved more freely, there is no pain, and the healing process at the inner canthus has exceeded his most sanguine expectations. The extreme nasal end of the lower eyelid, which was involved by the disease and which sloughed off after the application, is replaced by healthy tissue, so that no difference can be detected between the inner commissure of the eyelids of this and the opposite side.

Summary of Cases.—Dr. Granger's summary of the results in the list sent him by the editor is as follows, the list itself being printed in full in his paper:

The method was used in 58 cases (47 cancers and 11 sarcomas), ranging between the ages of 5 and 83. Of these 46 were inoperable. Nineteen (33 per cent.) are clinically cured. Ten (17 per cent.) cured over three years. Six (10 per cent.) cases well after five years. The method failed to give any results in 12 cases. The ultimate result in one case is not known, and two died during the operation.

Of the inoperable cases, 46 in number 11 (21 per cent.) are clinically cured, and 4 (9 per cent.) of these have passed the three-year limit. In 16 of the 19 cases clinically cured both microscopical and clinical diagnoses were made. The two cases that died during the operation were both hopelessly inoperable, and the treatment was used as a local palliative; one was a carcinoma of the left tonsil interfering by its size and pressure with respiration and the heart's action—respiration and the heart both ceased about a half hour after beginning the application; in the other case—an immense congenital sarcoma of the orbit in a child, recurrent after the removal of the eye nine months before—post-mortem examination revealed direct extension of tumor into the brain.

With two exceptions the cases reported as failures were hopeless and inoperable ones, in which the method was tried as a last resource, hoping to give some temporary local palliation. Five of these: (1) a recurrent carcinoma of the chest wall subsequent to five operations; (2) a recurrent carcinoma of the cervix following amputation four months before; (3) an immense recurrent sarcoma of the neck following five knife operations; (4) a recurrent sarcoma of both groins, following removal of the left testicle for sarcoma; (5) an immense recurrent sarcoma of palate extending through angle of jaw and neck, following recent knife operation and threatening suffocation, all desperate and inoperable, died shortly after the application was made.

Cases 13 and 18, considered as temporarily benefited, would have been among the cures, had the treatment been properly followed. Case 13, a cancer of the tongue, after local eradica-

tion, the disease recurred in the glands of the neck and patient refused further treatment; case 18, recurrent rodent ulcer of the face following curettement, after local eradication, patient neglected to have a small recurrent spot treated.

Carcinoma.—Of the 47 carcinoma cases 21 were recurrent after some cutting operation. Thirty-six were inoperable, of the latter 9 (25 per cent.) were clinically cured. Four (11 per cent.) cured over 3 years. The method was a palliative in 20 cases and gave no results in 7. In 14 cases metastasis existed prior to the use of the method; 7 of these died without local recurrence, and one was living at last accounts without local recurrence.

Eleven cases were operable; 8 of these are cured (72½ per cent.); 4 (36¼ per cent.) have passed the 3-year limit. The method was a palliative in two cases and proved a complete failure in one case.

The regions involved were as follows:

Breast, 15 cases—13 of these inoperable—clinically cured, 3; died of metastasis without local recurrence, 6; palliative, 2; failure, 3.

Face, 6 cases; inoperable, 4; clinically cured, 2; palliative, 2; failure, 2.

Mouth, 6 cases; inoperable, 3; clinically cured, 2; palliative, 3; failure, 1.

Cervix, 7 cases. Owing to the relative frequency of cancerous involvement of these and the rectal tissues, and the fact, as mentioned above, that operative procedures and the X-ray have given poor results in this class of cases, we will report the results in this and the following region more fully.

The one operable case was diagnosed both microscopically and clinically. The patient was cured and is now dying of phthisis pulmonalis seven years later. Of the six inoperable cases, one lived several months, dying of internal dissemination without return of the local symptoms; another died of peritonitis six days after the operation. In all four of the remaining cases the method afforded temporary local palliation, prolonging life several months in one case, three months in two cases and the ultimate result in the fourth case is not known. Two of the four cases were recurrent after some cutting operation. The broad ligaments had become involved in all four, in two the vaginal walls were also involved and in one there was extension to the recto-vaginal septum and pelvic floor.

Rectum, 4 cases. In all the diagnosis was made both microscopically and clinically; they were all inoperable. The upper rectum was involved in two cases and the lower rectum in the other two. Both the latter cases were recurrent, one following a modified Kraske operation ten months before; the other a perineal operation six months before. In the last case a large area was affected around the anus and to a point three inches above it, together with the vulva and the vagina. The X-rays

were used for a while with great improvement of the exposed part of the growth, but the part situated higher up continued to spread.

One of the cases involving the upper rectum is cured, the patient remaining well eight years later. The other case, in which there was almost complete stenosis, is in poor health, but there is no local return one year after the use of the method.

Of the recurrent cases, the disease was apparently eradicated and health restored; in the one following the Kraske operation, the patient lived two years, dying probably of metastasis, but without local return; the other following the perineal operation remains well seven months after the use of the method, and is considered clinically cured.

Other parts not Mentioned, 9 cases. Inoperable, 6; clinically cured, 4; palliative, 4; failure, 1.

Sarcoma.—Eleven cases, ten of which were inoperable; two are cured (1) a sarcoma of soft and hard palate, size of a goose egg, and threatening suffocation; patient well nine years later; (2) a spindle-celled sarcoma of the upper maxilla, displacing three teeth by protrusion into the mouth and causing protrusion of malar process and of arch of hard palate; patient well at the end of six years.

Dr. Granger's conclusions are as follows:

1. The method is capable of eradicating many growths as thoroughly as the knife, and yet bloodlessly, thus being adapted to situations where vascularity is great, and conserving the strength of the patient, who is frequently weakened by the loss of blood attending removal by the knife or curette.

2. It is incapable of producing an autoinfection of the edges of the destroyed area, because no infected cells of germs can exist within the effective radius of its energy.

3. The apparently healthy tissue beyond the slough is not only rendered inoculable, but is sterilized by the diffused chemicals, which tend to be forced along the paths of cancer proliferation, because these have a greater conductivity than the normal tissue. Besides a true selective action also results from the fact that cancer cells succumb more quickly to the diffused chemicals than normal cells.

4. As a cure or palliative in growths within the vagina or rectum it has proved of inestimable value, especially so on account of the inadequacy of the other methods of treatment. We can harmlessly and easily transmit the cataphoric products to the site of application by means of a conductor of comparatively small caliber so insulated as to absolutely protect the outer healthy parts of the canal, and yet capable of definite and controllable diffusion from the point of the conductor uncovered by insulation. We thus possess a means for the immediate destruction of malignant growths in the middle, and possibly the upper rectum without damage to or dilatation of the unaffected portions of the canal below the disease.

5. The cataphoric method offers the most practical and speedy process for the destruction of any local recurrences after the knife operation, if internal dissemination has not occurred, small subdermic growths within the course of lymphatic vessels being even removable under the local application of cocain or eucaïn.

6. In conclusion, I fully agree with Dr. G. G. Davis of Philadelphia when he says, "the performance requires study, work, and expense, and while these may be excuses, I do not regard them as proper reasons for not giving the method more extensive trial."

DISEASES OF THE ALIMENTARY CANAL.

EDITED BY WALTER H. WHITE, M. D.

The Drugless Treatment of Dyspepsia. By Otto Juettner, M. D., Ph. D., Medical World, July, 1903.

If we were to take a diagnostic census of all the chronic cases that go from one doctor to another without getting much relief, the cases of stomach trouble of one form or another would be very much in the majority. It is true that in a great many of these cases the symptoms do not point to the stomach as being the offending organ or part. It is a fact, however, that the stomach in these chronic ailments is either the whole cause of the trouble or a contributory element of importance. The patient may be nervous and irritable. He may be unable to sleep. He may suffer pain in the back or muscular pains in the extremities. He may be dizzy and unable to do his work. The medical attendant has his attention diverted by these symptoms and bases his treatment on a diagnosis which has nothing to justify it except a symptomatic suggestion in the complaints of his patient. Nine out of ten chronic cases are benefited in some way or another if the stomach is treated. It is my firm belief that in all chronic cases the stomach should receive our first attention. It makes no difference whether the symptoms point to the stomach or not.

I cannot conceive but two forms of stomach trouble. It is either an organic disease, or the local expression of some derangement of the nervous system. The latter condition cannot exist for any length of time without causing organic changes. Retention of undigested food is equivalent to distention of the stomach. Without any great fear of contradiction, I beg to state that a greater or lesser degree of dilatation of the stomach is present in all cases of chronic dyspepsia. It is the condition to be looked for and to be treated in the vast majority of chronics, especially those who are suffering from some nervous disorder of obscure origin.

The treatment of dilatation of the stomach (or atony of the

stomach, which is practically the same thing) rests upon a tripod, to wit: massage of the stomach, electricity, and proper feeding. Auxiliary agents of great value are irrigation of the colon and hygienic measures adapted to the individual case.

Massage of the Stomach.—Gradually the effects of better nutrition and powerful manipulation become manifest in the spontaneous efforts at contraction and functional activity which the stomach makes. The muscular fibers of the stomach walls are developed and become more active. The first subjective evidence is usually the disappearance of the pressure symptoms, especially those affecting the heart and the lungs. Incidentally there may be a relief of the constipation which frequently accompanies dyspepsia. This relief is due to the effect of stomach massage on the neighboring transverse colon, and to some extent to stimulation of the nerve tissue of the solar plexus. That these effects are real and not purely imaginary vaporings of an enthusiast, can be verified without much difficulty. The *modus operandi* of stomach massage is as follows:

The patient lies on his back with knees elevated. The operator stands on the left side of the patient, placing his right or left hand upon the patient's epigastrium. Deep but gentle pressure with the ball-portion of the hand alternates with pressure by the inner surface of the four fingers (not the tips of the fingers); at the same time the whole hand of the operator is rocked to and fro, carrying the whole epigastrium with it without sliding over the skin. The operator's hand must at all times remain in firm contact with the skin and carry the skin along. The treatment should not be given after a meal. It should last at least ten and not more than twenty minutes. It should be administered every day or every other day. The physician will soon learn to individualize his cases.

Electricity.—To intensify the effect of massage, various electro-therapeutic procedures may be employed with advantage. A weak faradic current will cause the muscular fibers of the stomach wall to respond. The galvanic current stimulates the nerve-supply of the affected region. The negative pole should be applied to the epigastrium. A negative static breeze over the stomach is a very useful application. The best electro-therapeutic addition to massage is by all odds the so-called "high-frequency" current applied directly over the stomach for ten minutes every day. All electro-therapeutic applications should be mild and non-irritating.

Proper Feeding.—Too much food is worse than the wrong kind of food. In all cases of dilatation, food offends more by its bulk than by its quality. The heroic "Hungertur" (starvation diet) of Johann Schroth is the classical type of the dietetic regimen which is applicable in all cases of gastric atony. Exclude nitrogenous foods. Find the kind of fresh fruit which is agreeable to the patient's palate and borne by the stomach.

Give plenty of fresh water, especially if the patient is inclined to sweat easily. Start the treatment by a three days' fast, giving nothing but bland crackers or stale white bread, washed down with half a glass of fresh water. If the patient's will power is in proportion to his desire to get well, the physician will have no difficulty in enforcing the regimen. On the third or fourth day give salted crackers, a little fresh fruit and occasionally add a little light wine to the water. Eventually add cooked vegetables, always consulting the palate and the tolerance of the stomach. Buttermilk is fine in most cases, fresh milk frequently objectionable.

Irrigation of the colon in the knee-chest position is one of the grandest adjuncts in the treatment of gastric disorder. It should be given at least three times a week. If we keep the transverse colon empty we are bound to relieve many of the pressure symptoms. Irrigation of the colon is usually followed by a feeling of buoyancy, the effect being due to relief of pressure on the nerve-supply posteriorly.

Hygienic Measures.—Keep the skin active by packs (Briessnitz) or dry-heat baths. Tonic cold sponge baths are excellent. Give the patients plenty of sunlight and the more fresh air the better. Exercise must be enforced. In cases of poor circulation general massage (hand massage or vibratory) is to be recommended.

Above all things, train your mind to look for improvement along the lines indicated and not to be misled by the illusory action of digestive ferments or the directly irritating effect of all so-called stomach tonics. The object of all scientific treatment should be to move causes and not to cover symptoms with the mantle of temporary improvement.

PHOTOTHERAPY.

EDITED BY MARGARET A. CLEAVES, M. D.

Schamberg in discussing the relative merits of ultra-violet rays, as per the method of Finsen and Roentgen rays in the treatment of diseases of the skin, concludes (1) that the use of ultra-violet rays by Finsen's method is generally recognized as producing the best results in lupus vulgaris, but that in order to secure good results it is necessary to employ the large lamp used by Finsen. The smaller and modified lamps may suffice for recent and superficial cases, but do not produce sufficient penetration of light to cure cases of long standing and deep seated lesions; (2) that the use of ultra-violet rays (in his hands) has effected some improvement in lupus erythematosus, but no cures. The most improvement has been shown in cases exhibiting telangiectases with but little thickening of the skin; (3) that the Roentgen ray treatment is to be given

preference over the ultra-violet ray treatment by Finsen's method when the lupus nodules are ulcerated, when the mucous membrane of the nose, lips, or mouth is affected, and probably, also, in hypertrophic and regulative forms of the disease.—*American Medicine*, December 19, 1903.

Remark. Schamberg's conclusions as to the value of the X-ray are not repeated here, covering as they do the same ground as that of other observers. There is no question of the correctness of his statement that the modified lamps of lesser amperage do not produce sufficient penetration of the active rays to cure long-standing and deep-seated lesions. This is a matter of quantity. It is not only light that is needed, but a large quantity of light in the treatment of lupus. There are many other skin conditions, however, that are readily influenced by the active rays from lamps of small amperage. Both types, therefore, have their uses. The need is for a lamp of considerable amperage, twenty-five amperes at least, the light from which can be used near the arc itself without the intervention of any water chamber, for, by the passage of the beam of light through 2.5 cm. of water even, it is estimated that four-fifths of its bactericidal power is lost.—THE EDITOR.

Radiant Energy.

According to Turner the forms of radiations used in medicine and surgery may be divided into five groups: (1) Radiant heat rays; (2) Ordinary Light; (3) Ultra-violet rays; (4) Roentgen rays; (5) Radium emanations and rays. Ultra-violet rays are powerfully actinic, excite fluorescence, discharge electrified bodies, produce nuclei for cloud condensation in moist air, and have clinical and bactericidal effects.

The nature of the Roentgen rays is still unknown. It is a question whether their effects are due entirely to the rays, or whether the electrostatic field and ionization around the tube also play a part.

The distinguishing radioactive properties of radium are that it gives a radioactive emanation and three kinds of rays— α rays, β rays, γ rays. The emanation is of the nature of a luminous gas which imparts radioactivity to objects in its path. The α rays are the least penetrative, the β rays resemble the cathode rays of a Crookes tube and are powerfully actinic. The γ rays are the most powerfully penetrative of all, and resemble the Roentgen rays from a hard tube. The inhalation of radium emanations by consumptive patients has been suggested. Human tissues are very susceptible to the action of radium rays, yet they seem to have but little bactericidal power. Its chief physiological effects are: (1) effects on the skin, producing inflammations and ulcers; (2) effects on the nervous system, producing paralysis and death; (3) luminous effects, produced in the partially blind. Persons who are totally blind

are unaffected by radium. It will probably prove useful in the same class of affections as are at present treated with the X-rays, ultra-violet rays, or high-frequency currents.—British Medical Journal, December 12, 1903.

Red Light Treatment of Smallpox.

Baer reports favorably upon this method of treatment. Thick red curtains were nailed over the windows and spectroscopic examination showed that only red light penetrated through them. The rooms were not so dark but that it was easy to avoid obstacles. Eighteen cases in all were treated on Finsen's plan. In nine slight cases there was neither suppuration nor secondary fever. The effects were more distinct in the severe cases. The rapidity with which the vesicles dried up in all cases was remarkable. In two very severe cases in which there was fever the eruption remained vesicular. Both ended fatally. Baer believed that the fatal result was due to the involvement of the mucous membranes. In several more suppurative cases it was noted that the vesicles became more distinctly confluent. Baer is of the opinion that Finsen's claim is justified, viz., that exclusion of white light and ultra-violet rays either entirely prevents the vesicles becoming pustular, or else restricts it to a very marked degree. On the severity of the infection itself, the red light treatment has no effect. The number of cases treated Baer regarded as too small to say definitely whether the mortality is reduced or not. The danger of marked pitting is undoubtedly lessened. In a case where the vesicles had already become slightly pustular, the red light treatment did not prevent the rest becoming pustular, but the patient had no fever. Finsen found in similar cases that further pustulation was prevented. München Med. Wochenschr., 1903, No. 42.

LARYNGOLOGY, RHINOLOGY, AND OTOLOGY.

EDITED BY W. SCHEPPEGRELL, A. M., M. D.

The Electrolytic Bougie in the Treatment of Chronic Catarrhal Otitis.

Much discussion has been recently published as regards the value of the electrolytic bougie in chronic catarrhal otitis media, some of which has already been reported in this department. In the July issue of The Laryngoscope, Dr. M. A. Goldstein, of St. Louis, states his belief that there is some value in the addition of a mild galvanic current with its stimulating effect on the mucous membrane, nerves and eustachian tube, but he is doubtful as to its mechanical and electrolytic effect. Unless great

caution is used the erosion of the surface of the tube may cause cicatricial stenosis aggravating the existing conditions.

In the same issue of *The Laryngoscope*, Dr. Arthur B. Duel, gives the results of his experience which, on the whole, have been favorable. In some cases one passage has been sufficient. He calls attention to the importance of a small bougie, small current strength, considerable time and a great deal of patience.

The Wisdom of Removing all of the Tonsils Whenever Enlarged and Diseased.

In patients in whom the tonsils are enlarged and diseased, the entire removal of the diseased tissue is indicated, being attended with marked increase in the health of the patient in various ways. (*Penn. Med. Jour.*, June.) The respiration is improved and the digestive functions are restored, and the taking of colds is much lessened. The chest assumes a fuller expansion, the voice becomes deeper and stronger and more beautiful. The entire health of the patient will show the good effects of the operation. The patient will be less liable to infectious and microbic diseases generally, especially diphtheria. The nasal catarrh will be improved. There will be a gradual atrophy of the enlarged lymphoid structures in the pharynx. The tendency to ear disease is diminished and the disease is corrected or improved. There will be no more attacks of tonsilitis if the tonsils are all removed. There will be no more developments if it be all removed—in other words, no recurrence.

HYDROTHERAPY.

EDITED BY CURRAN POPE, M. D.

The Balneotherapy of Chronic Articular Rheumatism.

Winkler believes that the use of extreme heat, either in the form of hot baths or hot mud baths, although it may not produce any immediate symptoms, if persisted in leads to weakening and degeneration of the heart muscle, so that patients who have undergone a course of treatment may return home and develop five or six months afterward dangerous cardiac symptoms. This danger may be largely avoided by the use of cold affusions or douche several times during the bath, or at least, at the end of it. If this hyperthermal treatment were beneficial he would be willing to employ it, despite the element of danger, but he believes that such high degrees of temperature are more capable of harm than of good in chronic rheumatism, and advises very strongly against their employment. On the other hand, he has had excellent results with the use of prolonged baths of moderately warm temperature. The term warm, when applied to baths, is relative, since the effect of the temperature

varies with the medium employed; that is, those forms of bath, such as the mud bath or hot water bath, in which the amount of moisture is large, cannot be borne at so high temperature as dry air. He recommends in the treatment of chronic articular rheumatism, mud baths from 20 minutes to 50 minutes at a temperature of 99° F. to 102° F.; for sand baths, 115° F. to 120° F.; for steam baths, 95° F. to 114° F., and 20 minutes' to 30 minutes' duration. The dry-air bath he employs by exposing the patient at first to a temperature of about 120° F. for half an hour, and later to a temperature of 150° F. for about five minutes. After each bath it is advisable to employ either a cold douche or cold affusion of some kind. The bath should not be given oftener than every other day. By these means he has obtained excellent results in cases which have resisted all other forms of treatment. The local application of heat may be of value as an adjuvant in this treatment, but he does not believe it capable of producing permanent relief. He employs the local hot bath on alternate days with the general hot bath. He believes that the excessively high temperatures, such as 300° F., which have been employed, are irrational and of little use.—*Amer. Med.*, December 12, 1903.

THERMOTHERAPY.

EDITED BY CLARENCE EDWARD SKINNER, M. D., LL. D.

Treatment of Septicæmia by Intense Heat. R. W. Carter, M. D., *Texas Medical News*, October, 1903, and *Journal of Scientific Medicine*.

Three cases are reported. The first occurred upon the person of a blacksmith who punctured the index finger of his right hand with a horseshoe nail. A few hours later the member became red, swollen, and painful, and by the next morning these symptoms had involved the entire arm nearly to the shoulder. Body temperature, 102° F.; pulse not recorded. The entire arm was treated with dry hot air for seventy minutes up to 400° F., with the resulting relief of symptoms and the inauguration of rapid recovery, which was complete, and the patient back at work, three days after the injury was sustained. But the one treatment was administered.

The second case was that of a veterinary surgeon who punctured his left hand while lancing an abscess on a horse. Ten hours later septicæmic phenomena developed. Two dry hot air treatments at 400° F. produced complete recovery.

The third case consisted of a lacerated wound of the dorsal side of the right hand which had become seriously infected and resulted in metastatic abscesses, the location of which is not recorded. The member was extremely painful, and very œdematous. The abscesses were incised, irrigated with full strength hydrozone, followed by a surgical dressing. Dry

hot air was then applied for seventy minutes up to 375° F. Dr. Carter describes the result as follows: "The improvement after this 'sterilization' by heat was simply astonishing. The next day an hour's treatment at 400° F. was administered, and the wounds, which had an unhealthy appearance in the beginning, began to granulate." Another treatment was given two days later, and the patient was discharged cured in ten days.

Dr. Carter's results will appear scarcely credible to those who are not familiar with dry hot air therapy, but we are happy to be able to state that we have many times seen similar cases. The dry hot air treatment of septic infection is one of the most gratifying of therapeutical experiences.

Tinnitus Aurium—Can it be Relieved? A Schloss, M. D., of San Francisco, Cal. *American Medicine*, September 12, 1903.

The article refers only to cases of tinnitus aurium in patients who are beginning to become deaf from catarrh of the tube or middle ear, or both, remembering that the phenomenon is only a symptom, not a disease. The author says: "Up to a few months ago the treatment of this class of patients was always an uncertain quantity with me, but now I do not hesitate to take a case, with the assurance that within a few weeks I can give them the relief they are seeking. Formerly, I used all kinds of treatment to relieve the patient of this distressing symptom, but with rather indifferent results until I began to use superheated air, or 'the hot air treatment.'"

He has been using the treatment for over a year and does not hesitate to pronounce it a success. Others who have tried the method have not had as good results, but this is believed to be due to inefficient technique. The author describes his technique as follows:

"I use a Hopkins' electric heater and allow the air to reach a temperature varying from 200 to 300 degrees Fah., depending on the case. This hot air is used at a pressure of five pounds or six pounds for as long a time as the patient can stand it, not exceeding five minutes. The diameter of the opening of the ear-piece is three-sixteenths of an inch, so that the volume of air used is considerable. The method of using or applying it is very easy. First, thoroughly cleanse the external auditory canal, then dry with a little alcohol. When the air is about the right temperature, place the ear-piece in the external auditory meatus and direct the stream of air as near as possible against the tympanum. At first I found patients complained of dizziness, or faintness, and in one case the patient fainted, but in the past few months I have had no such trouble, as I have become more familiar with it, or know

better how to handle my cases. I treat my patients three times a week for about eight weeks, and so far I have not met failure in the many cases I have had. I am not ready to report at this time as to the effect that this treatment has on deafness due to catarrh of the eustachian tube and middle ear, but will say that from my experience it is beneficial.

"My experience has been limited as to the use of hot air applied through a eustachian catheter into the eustachian tube, but in the cases I have tried it the results were not very promising. I believe the failures were due to the air not being hot enough, and it is impossible to use the air very hot as the eustachian catheter gets so warm that it is unbearable to the patient."

Therapeutic Value of Heat and Cold Applied to the Spinal Cord. By W. Frank Glenn, M. D. The Medical and Surgical Monitor for November, 1903.

Abstract of this paper will be found in this department of the JOURNAL, issue of March, 1904.

Hot-air Treatment of Gynecologic Affections. Wiener Klin Wochenschrift, Vienna.

The efficacy of dry heat in reducing pain and promoting absorption has been established to Burger's satisfaction from his experience with a number of cases treated by electric baths or application of superheated air. In 8 out of 12 cases of chronic perimetritis of six months' to nine years standing the patients were soon relieved of the pains in the sacral and lumbar region and felt better generally. In 5 of these improved cases the palpation findings were altered by the treatment. The improvement was rapid and pronounced in 13 out of 14 cases of parametritis. The patients were all markedly relieved and in most cases the objective improvement was also evident. An important point in this class of cases is that the hot-air treatment causes the retrogression of the parametric tumors and thus allows discovery of lesions higher up, in case they exist. The subsidence of pain is probably the result of the active hyperæmia. In several cases of inflammatory processes in the adnexa the inflammatory oedema retrogressed, and a case of actinomycosis was favorably influenced, as also 3 cases of abdominal fistula persisting after a laparotomy. Under the influence of the hot air applied to the fistula, which was first dried and dusted with iodoform to prevent scalding from steam, the wound began to granulate normally and rapidly healed. The menses were hastened by the action of the hot air in some cases, suggesting its application in amenorrhea.

SOCIETY MEETINGS.

AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION. THIRTEENTH ANNUAL MEETING.

Held in Atlantic City, N. J., September 22, 23, and 24, 1903.
Daniel R. Brower, M. D., Chicago, President.

(Continued.)

On motion of Dr. Snow, the report of the Committee on Classification and Nomenclature was deferred.

Dr. Alfred W. Bayliss, of Buffalo, read a paper, "Electro-Therapy as a Specialty." It was discussed by Dr. A. D. Rockwell, Dr. R. J. Nunn and Dr. W. B. Snow, and Dr. Bayliss closed the discussion.

Dr. Boardman Reed, of Philadelphia, read a paper, "The Effects of the Secondary Static Currents in removing Albumin and Casts from the Urine."

On motion, the discussion was postponed until the afternoon session, and the session adjourned at 1 P. M.

AFTERNOON SESSION.

The meeting was called to order by the President at 3.15 P. M.

Dr. Reed's paper was discussed by Dr. A. D. Rockwell, Dr. W. B. Snow and Dr. G. Betton Massey, and the discussion was closed by Dr. Reed.

Dr. A. D. Rockwell, of New York, read a paper, "Some Principles upon which is based the Use of Electricity in Nervous Diseases."

Dr. Russell H. Boggs, of Pittsburg, read a paper, "X-ray and Light in the Treatment of Tuberculosis." It was discussed by Dr. C. R. Dickson, Dr. W. B. Snow, Dr. Robert Reyburn, Dr. T. A. Pease, Dr. F. B. Bishop, Dr. A. D. Rockwell, Dr. George Z. Goodell and Dr. Willis P. Spring, and the discussion was closed by Dr. Boggs.

Dr. Francis G. DuBose, of Selma, Ala., sent a paper, "Currents of High Frequency, Apparatus and Therapeutic Uses," which, in his absence, was read by Dr. Massey. It was discussed by Dr. A. D. Rockwell, Dr. F. B. Bishop, Dr. A. Bayliss, Dr. A. W. Baer, and Dr. G. B. Massey.

Dr. George Z. Goodell, of Salem, Mass., read a paper, "Electricity in the Treatment of Chronic Deafness." It was discussed by Dr. R. J. Nunn, and Dr. Goodell made some closing remarks.

Dr. Charles W. Daniels, of Savannah, Ga., sent a paper, "Clinical Report on the Use of the X-ray in Lesions of the Spinal Cord" which, by special permission of the association, was read by Dr. Snow.

Dr. William Benham Snow, of New York, read a paper, "Employment of Static Electricity in the Treatment of Nervous Diseases."

On motion, adjourned at 6 P. M.

EVENING SESSION.

The association reconvened at the call of the Vice-President, Dr. Maurice F. Pilgrim, at 7.50 P. M., and the discussion of Dr. Snow's paper was taken up. The discussion was participated in by Dr. A. C. Bayliss, Dr. R. J. Nunn and Dr. T. A. Pease, the discussion being closed by Dr. Snow. By unanimous consent, the discussion was then reopened, and Dr. C. O. Files, Dr. T. A. Pease, and J. R. Stuart took part in the same.

Dr. Laura Viola Gustin-Mackie, of Attleboro, Mass., read a paper, "A Year's Work in Electro-Therapy," which was discussed by Dr. Marcus M. Johnson.

Dr. Margaret A. Cleaves, of New York, read a paper, "Electrical Treatment of Trachoma and Corneal Opacity, with Illustrative Cases." It was discussed by Dr. A. C. Geyser.

Dr. Albert C. Geyser, of New York, read a paper, "The Successful Treatment of Eighteen Cases of Granular Lids by the X-ray and High Frequency Vacuum Electrodes." It was discussed by Dr. M. A. Cleaves, Dr. A. W. Baer, Dr. J. R. Stuart, and Dr. R. J. Nunn. Dr. Geyser closed the discussion.

SECOND DAY. WEDNESDAY, SEPTEMBER, 23. MORNING SESSION.

The meeting was called to order by the President at 9.15 A. M.

Drs. Boardman Reed and A. W. Baer were appointed an auditing committee.

The meeting was called to order by the President at 9.15 ship: Dr. H. Finkerperl, Pittsburg; Dr. Roberts P. Isler, Waycross, Ga.; Dr. W. D. Haight, of Johnstown, Pa.; Dr. William Gray Schaufler, of Lakewood, N. J.; Dr. C. A. Forster of Newark, Ohio; Dr. J. K. Roberts, of Lewisburg, Pa.; Dr. Samuel G. Slaughter of Lynchburg, Va.

On motion of Dr. Herdman, voting on these candidates was proceeded with by holding up the right hand. They were all unanimously elected.

A communication was read from Dr. E. W. Smith, Terre Haute, Ind., stating his inability to be present, and accompanied by his paper.

On motion, the paper, "Roentgen Ray in the Treatment and Cure of Cancer of the Uterus, Lupus, Rodent Ulcer and Eczema, with Histories of Cases Treated," was read by title.

The President appointed the following as the Committee on Nominations: Dr. Lucy Hall-Brown, Chairman; Dr. C. R. Dickson; Dr. C. O. Files.

On motion of Dr. Snow, seconded by Dr. Baer, the Secretary was empowered to cast the ballot for their election to the Nominating Committee. The ballot was cast, and they were declared duly elected.

Dr. W. J. Herdman moved that the Secretary be authorized to have printed not less than 300 copies of the Constitution and By-laws. Seconded by Dr. Baer and carried unanimously.

Dr. W. B. Snow moved that the association adopt or accept as the code of ethics that portion referring to the admission of homeopathic physicians to the association.

The President ruled that the motion was not necessary because, according to the Constitution the Association keeps in line with the American Medical Association in this matter.

Executive session adjourned at 9.30 A. M.

Dr. Francis B. Bishop, of Washington, D. C., read a paper, "Exophthalmic Goiter and its Rational Treatment." It was discussed by Dr. G. Betton Massey, Dr. T. A. Pease, Dr. A. D. Rockwell, Dr. W. W. Eaton, and Dr. Bishop closed the discussion.

The next order was the discussion of Problems in Electro-Therapeutic Practice. This was participated in by Dr. C. R. Dickson, Dr. W. B. Snow, Dr. Willis P. Spring, Dr. W. J. Herdman, Dr. A. W. Baer, Dr. C. O. Files, Dr. Loring, Dr. A. C. Bayliss, Dr. G. Z. Goodell and Dr. R. J. Nunn.

Dr. G. Betton Massey then described his method of "Zinc-Mercuric Cataphoresis of Tuberculous Glands," and exhibited two patients. Drs. Reyburn, Cleaves, Pease, Bishop, Snow, and Massey took part in the discussion.

Dr. A. C. Geyser exhibited a form of scrap-book that he had found useful.

On motion of Dr. Dickson, the paper of the late Dr. Robert Newman, "Retrospect of the Second International Congress on Electro-Therapeutics at Bern," was ordered read by title.

Dr. Bayliss spoke of the exhibit of all forms of electrical instruments at the International Congress at Bern as one of the most important features of that gathering.

Dr. William J. Herdman of Ann Arbor, Mich., read a paper, "A Plea for Electro-Therapeutics Proper." It was discussed by Dr. M. A. Cleaves, Dr. C. R. Dickson, Dr. G. Betton Massey, Dr. M. M. Johnson, Dr. F. B. Bishop, and Dr. W. B. Snow. Dr. Herdman closed the discussion.

Dr. Thomas D. Crothers, of Hartford, read a paper, "Radiant Light Baths in the Treatment of Neuroses." It was discussed by Dr. Cleaves, Dr. Crothers making some closing remarks.

Dr. Charles A. Covell, of Syracuse, read a paper, "A Case of Asthma with Fibroids and Pelvic Adhesions, cured by Galvanism." It was discussed by L. V. Gustin-Mackie.

Dr. G. Z. Goodell moved that as the next papers were on the

Roentgen ray, they should all be read, and then discussed together. Seconded and carried.

Dr. Marcus M. Johnson, of Hartford, read a paper, "The Use of the X-ray in the Treatment of Malignant Growths."

Dr. T. D. Crothers presented a volunteer paper on "An Improved Static Machine."

Adjournment at 12.40 P. M.

MEETING OF THE CLINICAL SOCIETY OF THE NEW YORK SCHOOL OF PHYSICAL THERA- PEUTICS.

Stated Meeting, December 18, 1903. Leslie Meacham, M. D., in the Chair.

Margaret A. Cleaves, M. D., read a paper, on "The Physiological Action of Light and the Physical Factors in Phototherapy."

Discussion.

Dr. G. Betton Massey: I would like to ask as to the various light mechanisms and their value in the different light energies.

Dr. Morris W. Brinkmann: Dr. Cleaves has certainly given evidence of great research. There is a marked difference in the light of the solar spectrum and the electric arc spectrum. The length of the solar spectrum is to that of the electric arc spectrum as one is to nine. Hence, the wave length of the ultra-violet rays is greater in the electric arc spectrum than in the solar spectrum, but the enormous intensity of the rays of the solar spectrum outdoes it otherwise. We must have a measure as of other physical measurements. In photographic paper we have one means of measurement which I have used in testing a coil with an arc lamp and I find that the vibrations vary. I believe that therapeutically, our future lies in the study of effects in the spectrum at stated distances in a stated time, with accurate measurements.

Dr. Sigismund Cohn: The rays of the sunlight, as we get them have only few ultra-violet rays, but the arc light abounds in them. Dr. Cleaves has given us a very instructive paper on a difficult subject. It is hardly ten years since Dr. Kellogg described his incandescent light bath. A few years later Fin- sen electrified the world by his scientific researches and clinical results with the administration of the chemical rays. Then the therapeutic action of the X-rays was brought forth, and lately we have heard about the radium-therapy.

As regards the direct physiological action of radiant light upon the tissues, we have to consider, that only the X-rays will travel deep enough into the tissues, to influence any morbid processes. We have heard how the chemical rays contract

muscles, but I believe they do not act that way, in living tissue, because, they are absorbed by the skin and blood-corpuscles before they reach so far. Nevertheless in an indirect way the chemical as well as the heat rays will be of great value. As regards the latter the question arises: Is there any difference in the action on the body of radiant heat and conducted heat? Dr. Keltogg claimed that elimination is greater from radiant heat, as represented by an electric-light bath, than from a bath supplied with conducted heat (hot-air, vapor, etc.). Another question is: Is there any specific action of the radiant electric light bath? In fact, there is. First, it produces perspiration in a shorter time (4 to 7 minutes), and second, it produces this perspiration at a temperature so low, as no other source of heat would accomplish, generally between 85° and 95° F. This is an important fact when we consider that the depression of the heart's action is caused by the direct influence of heat upon the heart, etc. To make a study of the physiological action of the radiant heat bath, it is necessary that no disturbing factors enter in the results, and that our experiments are made, as far as possible, with radiant heat, and that conducted heat is excluded. In an electric-light bath as they are built to-day, during the first few minutes, the air is not heated, but then the temperature gradually rises to 110° and 120° and more. The patient will receive a combination of radiant heat, hot air, and if we consider the immense perspiration with following evaporation, a vapor bath. In my bath the light is thrown into the cabinet from the outside, through holes in the walls, and I can change the inside air as much as I desire. You can avoid all drafts in this bath, as all air is warmed before entering, because it passes over the lamps, and I believe, we have here real radiant heat. In an arc light bath the temperature must be higher before perspiration sets in, on account of possessing less heat; but more chemical rays.

Dr. Herman Grad: I am interested in learning that so much progress has been made in phototherapy. As the light has no direct effect on bacteria in living tissue, we know how to treat pathological conditions due to bacterial origin; that is, we must increase the nutrition-activity of the part. The paper was highly instructive and of great value.

Dr. Margaret A. Cleaves: Finsen used an 80 ampere arc and the results obtained by him are regarded in a sense as a measure of the energy used. It is an expensive apparatus and expensive to operate, as it consumes an enormous amount of current. We have in use here at the school, a water-cooled iron electrode lamp, manufactured by the Kny Scheerer Co. It is rich in chemical activities. Another good lamp is the London Hospital lamp, originally the Lortet and Genoud lamp. This is manufactured and sold by Truax, Green & Co., in this country.

We also have in use here a 25 ampere marine searchlight (Chas. J. Bogue) which gives most excellent clinical results.

The great objection to water-cooled lamps, is that a certain proportion of the ultra-violet rays are absorbed by the water, estimated at four-fifths, in passing through 2.5 cm. of water. Something extremely practical in apparatus will probably be the outcome of the experiments of Bernard and Morgan. The statement to which Dr. Cohn referred, was that Parville had found that the chemical rays produced excitation of the peripheral nerves. The sun is richest in ultra-violet rays, but they are lost in transit from the sun to the earth. The arc light is extremely rich in ultra-violet rays and is therefore the best source of light for therapeutic work.

Dr. G. Betton Massey: Dr. Grad says that the rays had no bactericidal action.

Dr. Margaret A. Cleaves: Yes, Dr. Grad and I agree. The rays have no bactericidal action on *living* tissue. The short ultra-violet rays decrease the physiological resistance, and so they have a bactericidal action by increasing the patient's resistance.

Morris W. Brinkmann, M. D., then read a paper, "Lobar Pneumonia a Secondary Disease and Curable by Physical Agents."

BOOK REVIEWS.

HOW TO ATTRACT AND HOLD AN AUDIENCE. A Popular Treatise on the Nature, Preparation, and Delivery of Discourse. By J. BERG A. M., Lit. D., Professor of the English Language and Literature in the Pennsylvania Military College. Published by Hinds & Noble, 31, 33, 35 W. Fifteenth Street, New York City. Price, \$1.00, net.

This little book is a popular treatise and guide for students and others who would perfect themselves as public speakers in methods of preparation and delivery. The subject is treated in a clear and forceful manner. The divisions of the volume are clearly marked, which with an unusually full index greatly assists when referring to the work.

A concise and practical work of this sort will be highly appreciated by the man who would polish himself as a public speaker. The book is bound and printed in attractive style.

ROGER ON INFECTIOUS DISEASES; THEIR ETIOLOGY, DIAGNOSIS AND TREATMENT. By G. H. ROGER, Professor Extraordinary in the Faculty of Medicine of Paris, etc.; translated by M. S. GABRIEL, M. D., New York. In one octavo volume of 864 pages, with 43 illustrations. Cloth, \$5.75, net. Lea Brothers & Co., Philadelphia and New York, 1903.

This volume is prepared by a man who is both a laboratory investigator and a thorough clinician, being attendant at the

Hôtel Dieu and at Porte d'Aubervilliers, where all the contagion of Paris is carried.

It embraces almost the whole scope of bacteriology, internal medicine, and the basic principles of surgery. The author first studies the pathogenic agents, their distribution in nature, the condition under which they attack man and their modes of invasion.

The chapter on diagnosis is very short and is devoted almost entirely to chemical and bacteriological methods. That on therapeutics embraces one-quarter of the volume and is very full and complete.

B. M.

THE MEDICAL NEWS VISITING LIST, 1904: Records of practice for thirty patients per week, Lea Brothers & Co., Philadelphia and New York, is of convenient size for the pocket and contains in addition space for obstetrical records, addresses, costs, accounts, etc., besides a list of poisons and their antidotes, a dose list, and much other handy information. Physicians will find this a neat and convenient record for keeping their accounts systematically.

THE PHYSICIAN'S VISITING LIST FOR 1904. Philadelphia. P. Blakiston's Son & Co. (Successors to Lindsay & Blakiston). 1012 Walnut Street. Price \$1.00, net.

The work is complete and comprehensive in arrangement, neat, attractive, and substantial in form. It is a valuable addition to a physician's possessions and comfort, and can be highly recommended to all practitioners.

NEW AND IMPROVED APPARATUS.

This department is devoted to publishing, with illustrations, drawings, and descriptions, new apparatus, electrodes, etc., for the benefit of those interested in the progressive improvements in armamentaria.

THE PERFECTION VIBRO-MASSAGE MACHINE WITH ELECTRICAL ATTACHMENT.

The vibrator in the handle is operated through a pliable shaft connecting it with an electric motor, which takes its electric current from incandescent electric light wires, through an extension plug which is screwed into a socket whence an incandescent lamp has been removed. It is so adjusted that rapid or slow, light or heavy strokes of the vibrator may be produced at the will of the operator.

The electric motor is located in a hexagonal cabinet made of quarter-sawed oak with antique finish, and highly polished. In the cabinet with the motor is a faradic electric coil of high-

tension, connected by a switch with the wires that feed the electric motor. To the binding posts of this coil are attached wires for conducting electricity of any required intensity and power to the patient under treatment. The cabinet rests on a richly carved pedestal of quarter-sawed oak, antique, all with fine piano finish, making it an ornament for office or parlor.

This combination to give electric treatment and vibration from the same cabinet, and at the same moment if desired, is



something quite new. Nearly every physician uses, or would like to use, both electricity and vibratory massage in his practice. The manufacturers have made the cabinet detachable from the pedestal so that by a handle fastened to the top, the cabinet may be lifted from the pedestal and carried to the sick room, and used there every way as well as in the office, provided the electric current is there available. Manufactured by the Western Surgical Instrument House, of Chicago, Ill.

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No. 3.

A PLEA FOR ELECTRO-THERAPEUTICS PROPER.*

BY W. J. HERDMAN, M. D., LL. D., ANN ARBOR, MICH.

I have been prompted to select the title for my paper because of the conviction that has grown upon me in recent years that this Society is in danger of selling its birthright for a mess of pottage.

Fifteen years ago a group of earnest men, who had long recognized by personal experience and intelligent study, that the medical profession was leaving to the ignorant and the unprincipled camp-followers of the profession one of the most valuable therapeutic resources which we possess, organized this Association with the view of separating truth from error, reality from pretense, honest dealing from imposture, and of furnishing to the medical profession and to the world convincing evidence that the various modalities of electric energy, while not omnipotent, have yet a health-giving value that must be taken into account in any system of therapeutics that is worthy of the name.

How well this laudable purpose has been fulfilled by the charter members, and by the able associated members of high-standing in the several fields of the physical sciences, whom they wisely called to their assistance, is witnessed by the accumulated records of thoughtful studies, the substantial recognition already accorded to this branch of therapeutics by the medical profession, and the broad range of relationship of electricity to life-processes which their researches have revealed.

But the very success and popularity which has resulted from these well-conceived and well-directed efforts of the Association are fraught with an element of danger which must not be overlooked.

* Read at the thirteenth annual meeting of the American Electro-Therapeutic Association, at Atlantic City, September 23, 1903.

The very richness of the soil in which we have sown our seed threatens to be the cause of our undoing. The habits and expectations of the patient husbandman are turned topsy-turvy by new and unexpected discoveries.

In boring for water to irrigate his crops, oil suddenly comes to the surface, and the goodly land and its natural products are neglected, experience thrown aside, and the imagination runs wild, fired by new hopes and new desires in which the profit is chimerical or short-lived. These new and startling discoveries also bring to the territory many adventurers seeking for gain, hoping to ride into fame and affluence on the tidal wave of a new departure in therapeutics.

The recent trend of our medical periodic literature, and the subject matter of a large share of the papers presented before this Association during its recent annual meetings, will explain to you my meaning—if it needs any explanation.

The new and the fanciful, the startling and the unexpected phenomena that have sprung up before us while we have been engaged in our electro-therapeutic studies proper, have dazzled our eyes. Have they not also sent many of us off on a wild quest after some *ignis fatuus*, and away from that clear path and sound footing which we had hitherto found safe, and which was certainly leading us to sure and valuable results within our own field? Perhaps it is well that the adventurous and exploring spirit is strong within us, and that there are always some who are ready, at all times, to enter upon a quest in the unknown and the unexplored regions that surround us on every hand, but it always casts doubts on the value of that which has been already found when it is suddenly neglected or abandoned for some new attraction, especially by those who have been the chief advocates of its claims to serious consideration.

Is it needful for me to speak plainer and declare that I regard it as a serious mistake on the part of this Association to allow so much of its time and attention to be given up, as it has been recently, both in its regular sessions and in the pages of its representative journals, to the consideration of that which is not in reality electro-therapeutics, but which is at the best but borderland material, and only related to electro-energy through some one or other of its many transformations?

Now, do not understand me as attempting to discourage

legitimate research work in these borderland studies, even by those who are well-grounded in electro-therapeutics. On the contrary, I regard those who have gained their mental equipment, and who are most experienced in the practical technique, by dealing with the electric modalities in therapeutic applications, as the best qualified to speak authoritatively as to results that are obtained upon the human body even by X-rays, actinic rays, electric light, violet light, mechanical vibration, or whatever other transformation of electric energy may be employed. My protest is directed especially against the abandonment, or neglect, of that more legitimate, and, in my judgment, more profitable line of research and therapeutic practice for which this Association was primarily organized,—the therapeutic use of the *electric modalities proper*.

There are, perhaps, few of us who daily make use of electricity in our practice who have at any time stopped to consider how rich is the field of resource that this agent offers us for combating disease in its protean forms. If you take up one of our most recent works on *Materia Medica and Therapeutics* you will find the substances there enumerated and described, arranged according to their therapeutic effect upon the human or animal organism as:

(a) Excitants, irritants, stimulants, tonics, styptics, astringents, hemostatics.

(b) Analgesics, anodynes, anæsthetics, sedatives, depressants, hypnotics, anti-spasmodics.

(c) Purgatives, eliminants, diaphoretics, diuretics, emenagogues, galactagogues, and oxytoxics.

(d) Alteratives, restoratives, constructives, nutrients.

(e) Parasiticides, antizymotics, and bactericides.

There are others, but these are quite sufficient to serve my purpose in recalling to your minds how completely this one physiological therapeutic agent can be made to supply the place of a great host of drugs, classified by reason of their action under one or other of these headings; for when employed intelligently and skillfully electricity is able, in one or another of its forms, to produce every one of these effects upon the human organism.

If this is true, then electricity deserves a place in several of the important groups of remedies which the *materia medica* describes. The experienced electro-therapist knows this

claim for efficiency in the action of electricity both in medical and surgical therapeutics to be true, and that this assertion is based upon sound and demonstrable physical and physiological facts and principles; which is more than can be said for many of the drugs used and recommended by high authority.

The modalities of electricity that are employed, at present, to a greater or less extent in therapeutics, and whose efficiency can be readily demonstrated, are:

- (1) The constant or galvanic current.
- (2) The induced current derived from
 - (a) The physician's induction coil.
 - (b) The magneto-electric machine.
 - (c) The alternating current dynamo.
 - (d) The sinusoidal machine.
- (3) Currents obtained from the high-tension high-frequency apparatus; the static induced currents.
- (4) The static charge or the currents direct from the influence machine.
- (5) Magnetic fields or alternating magnetic stress.

Each of these modalities possesses a physical and physiological action peculiar to itself, and by reason of this has its special adaptation to certain pathological states.

The Direct or Constant Current.—By means of this current the physician obtains knowledge concerning the action, nutrition, and capacities of muscles and nerves that can be obtained in no other way. It is thus, in the first place, an indispensable means for *Diagnosis*.

It causes contraction of muscular tissue, both of the striped and unstriped varieties, and invigorates the processes which depend upon this muscular activity—the circulation of the blood and lymph, intestinal peristalsis, muscular contraction of the bladder, uterus, etc. It is thus *tonic, stimulant, purgative, and eliminant*.

By its action nutritive material may be conveyed in greater abundance to the tissues needing it, and the metabolism of the tissues may be quickened. Thus it is *alterative, constructive, and restorative*.

Through its influence on the muscular walls of the intestines, the uterus, and excreting organs and blood-vessels elimination is promoted, and the irregular distribution of blood as in hypostasis and passive congestion is overcome. Thus it is *purgative, diuretic, oxytoxic, eliminant*.

By means of it exudates and neoplasms are broken up by electrolysis and prepared for removal. Thus it is both *destructive* and *eliminant* to injurious and useless products.

By its aid morbid fluids and substances in solution in them are removed from the tissues of the body and remedies in solution may be brought into them. *Elimination* and *medication* by phoresis.

It is both directly and indirectly germicidal because of its electrolytic action, and gives promise, in the results of recent experiments, of a capacity to transform toxins into antitoxins. Thus it is *antitoxic*, *antiseptic*, *disinfectant*.

The local effects of the anode of a constant current upon nerve tissues is such as to diminish its excitability, giving an action *sedative*, *analgesic*, *antispasmodic*.

It is thus seen that the constant current which possesses chemical, physical, and mechanical properties, can be turned to therapeutic account to meet and counteract a great variety of morbid conditions which physicians and surgeons are daily called upon to counteract and remove.

This electric modality has, as we have already noted, its function as a direct stimulant of nerve and muscle, or is sedative in its action upon these tissues according to the polarity employed and the manner of application, but a more appropriate modality for these purposes, within the range of physiological action, is found in some of the various forms of the induced current.

The characteristics of the current induced depend upon the construction of the machine which produces it. The physiological, and, in turn, the therapeutic effects following the use of these currents, as of all electric currents, are the results of these characteristics of the current. Every electric current, in other words, has its "characteristics of excitation," and when used for therapeutic purposes these determine its physiological and therapeutic effects.

In the several kinds of apparatus mentioned above, from which currents are derived, the *principle* of induction is the same, just as in the various forms of steam engine in use, the physical and mechanical principles are the same. But the nature of the work done by these several kinds of apparatus, just as it is with the different kinds of steam engine, may vary greatly.

All of the induced currents employed in Electro-therapeutics, with the exception of the primary-coil current of the physician's induction coil, or faradic battery, and dynamo currents, with the commutator, are to and fro, or alternating currents. They are also currents of comparatively high electromotive force as compared with the constant or voltaic currents used, but with very little quantity or amperage.

Living and normal nerve and muscle of a kind that is found in man and other warm-blooded animals, when made a part of the path of an electric current of moderate frequency, tension, and quantity, react in a manner corresponding to their physiological action at every sudden change of electromotive force or potential, no matter in which direction the current travels. Induced currents, as well as constant currents, are, therefore, exciters of nerve and muscle tissue, and the force and frequency of such excitation depend upon the degree of electromotive force and the frequency of its variations.

The protoplasm of living tissue cells, other than those of nerve and muscle, also reacts in some measure to the sudden change of electric potential to which they are subjected by an induced to and fro current, in a manner differing from their response to constant currents, for the metabolism of the cells is quickened, and improved growth and tone is the result of such applications in those patients whose nutrition was before feeble. But the momentary duration of each impulse, and the reversal of polarity which characterizes the alternating induced currents, deprive them of the electrolytic, phoretic, and mechanical action which the direct or galvanic current possesses.

Sensory and motor nerve or muscular fiber can respond in the manner peculiar to each of them when subjected to electric excitations to the number of from 6,000 to 10,000 per second. But in proportion as the frequency of the alternations and the range of potential increases the physiological response of nerve and muscle, as such, diminishes.

The lower frequencies and lower potentials of induced currents have, generally speaking, an exciting and irritating effect, the higher potentials and frequencies a quieting and sedative effect on nerve and muscle. The *manner* in which the potential increases and decreases likewise has its influence on sensation and motion, irrespective of the degree of the potential or the *rapidity* of alternations.

A current in which there is abrupt or irregular increase or decrease of electromotive force is irritating and exciting, while one that is smoothly graduated in its rise and fall of potential is soothing and agreeable. The induced current derived from the primary of the physician's induction coil or faradic battery, and that from the magneto-electric machine partake of the exciting and irritating properties, while the current from the secondary of a physician's induction coil, provided it is composed of many turns of very fine wire, and the current from a well-constructed sinusoidal machine, are less disagreeable to the patient and often quite soothing and sedative in their effect. The current from the alternating current dynamo, employed for industrial purposes, when adapted to therapeutic uses, possesses qualities somewhere between these two extremes.

(To be continued.)



THE PRESENT STATUS OF X-RAY THERAPY IN THE MANAGEMENT OF CANCER.*

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Mr. President and Members of the American Electro-Therapeutic Association :

Two years ago the medical world had just begun to awaken to a knowledge of the fact that the X-ray was about to enter the field of therapeutics. One year ago the accumulation of clinical experience had reached a point which placed the justice of this inference beyond the possibility of controversion, and to-day it only remains to ascertain the limitations of this astonishing force.

In conformity with the universal law governing human thought, the pendulum of opinion in the minds of most of the agent's advocates, swung too far in the original direction of enthusiastic homage. Although this excessive enthusiasm presents an aspect of justifiability when the marvelously beneficent powers of the X-ray which had then been manifested in many cases, are considered, yet the logical effect of the failures to fulfill rosy promises which have since transpired would be and has been upon the minds of the profession at large, to force the pendulum upon its return, nearly as far into error upon the other side of the truth.

The tendency of the human mind is always towards extremes, and this tendency is correctable only by accumulated experiences. These have accrued in great quantity and with remarkable rapidity during the past year, and if it was quantity of experiences and observations only that were needed to determine the limitation, we should be in a position to-day to state conclusively just where the X-ray belonged in the management of cancer. Unfortunately, however, the scientific reliability of statements by workers in this field must be judged at present

* Read before the Thirteenth Annual Convention of the American Electro-Therapeutic Association at Atlantic City, N. J., September 22, 23, and 24, 1903.

in the light of their individual ability, skill, and experience in this particular field, and when we consider the subject from this point of view we perceive at once that a complicated problem is still awaiting solution.

Prominent among the factors which combine to produce this condition of uncertainty are the following:

First, almost every physician who sees a cancer cured by the X-ray immediately becomes imbued with an enthusiastic desire to acquire the art of X-ray therapy himself. In the vast majority of cases he has never seen an X-ray generator before and does not know how to run one until instructed by the manufacturer. He is incapable of judging as to the efficiency of a given apparatus himself and must take the manufacturer's word for it. The physician at large is a credulous individual, and there have been many machines upon the market which were entirely inefficient for the purposes of X-ray therapy. Results reported under such conditions cannot be considered reliable indices as to the actual possibilities of the treatment.

Second, the novice is absolutely ignorant of the various potentialities of the agent, both beneficent and dangerous. The procedure looks easy, however; the result he has witnessed is unquestionable, and the trustful physician takes the word of many a salesman that he "can teach him all there is to it in half an hour after the machine is installed." There are, therefore, thousands of physicians applying X-rays to the treatment of cancer to-day, who are struggling through the sins of omission and commission which characterize the initiatory experiences of the novice in X-ray therapy, and it is not at all strange that contradictory and unsatisfactory reports should at present confuse attempts to define its therapeutical position. With an agent in the technical manipulation of which, art, as opposed to exact science, plays so prominent a part, it is a wonder that there is even as much agreement as there is, in reference to the subject under discussion, and no wonder at all that serious consequences to the patient, as well as failure in securing satisfactory clinical results so frequently come under observation.

Third, some of the world's noted clinicians have adopted the use of X-ray therapy, but instead of familiarizing themselves with the subject, or employing an experienced X-ray therapist, have entrusted its application to a radiographer, who is by no means necessarily a good X-ray therapist, or even in some cases

to a nurse, and have reported over their signatures, the clinical results obtained under these most inadequate conditions. Their names have given a weight to these reports to which they were not entitled by their intrinsic value, and thus a weighty element of confusion has appeared in the problem.

I will not enter this phase of the subject further. My intention in discussing it at all was merely to call attention to the impossibility of formulating a positive verdict as to the limitations of X-ray therapy to-day, and to utter a word of warning against unmodified acceptance of the pessimistic convictions under which are laboring many of our most esteemed colleagues. Reliance upon the dictates of such convictions would result in unjustifiable and unnecessary destruction of all hope of relief to a large number of the victims of cancerous degenerations.

Malignant processes may be divided to-day with reference to the influence of X-ray therapy, into three primary groups: those affecting the layers of the true skin only, those affecting the deeper soft structures either with or without involvement of the integument, and those affecting the bones. Although some cases belonging in the first mentioned group have been found to exhibit the responsive, or perhaps I should say the unresponsive phenomena characteristic of cases classed in the other categories, and some cases belonging in the second group have been observed which have reacted in a manner that we have been led to expect with members of the first group, yet as far as I have been able to ascertain this division holds good in the main for purposes of general consideration. It is to be hoped that the histological structure of malignant growths will ultimately be found capable of furnishing us with a means of deciding whether or not and in what degree a given case will be likely to respond happily to applications of the X-ray, but up to the present time the microscope has proven to be entirely unreliable as a guide for this purpose, and our prognosis in these cases, *immediately*, must still remain enshrouded in the mists of uncertainty. It appears at the present time, moreover, as though individual idiosyncrasy will prove to be a permanently embarrassing factor in the problem, and the influence of this factor cannot of course be estimated in a given case until after the rays have been applied.

In the first group of cases the X-ray may be said to be one of

the best if not the very best, of all the remedial agents that are now known to be helpful in the management of malignant disease. This statement at first sight may appear to be more radical than justifiable, but it is based upon the following facts, and, "Facts are stubborn things."

First, the total number of cases treated, both operable and inoperable, and the number of those now available for statistical purposes runs up into the hundreds, as large a proportion has been cured as has ever been claimed as the result of any other management. Some writers claim, and apparently with justice, that the proportion of cures is larger.

Second, of the cases cured a much smaller proportion has shown evidences of recurrence within a given period of time following the cure, as compared with the recurrences observed within a like period of time following the cure of cases by the knife or caustics, and the vast majority of recurrent cases have readily responded to a second application of the rays.

Third, the cosmetic effect obtaining after the X-ray cure of cutaneous cancer is incomparably superior to that obtainable by a cutting operation, or by the application of escharotic pastes.

Fourth, the application of the X-ray is not only usually quite devoid of painful consequences, but is frequently capable of entirely relieving the pain which is already present as the direct result of the cancerous process.

Dr. W. A. Pusey, in his masterly work upon X-ray therapy published last May, says: "In cutaneous carcinoma without metastasis the method has a list of well established successfully treated cases, sufficient to give it standing in comparison with any other method of treating such lesions. Even for cases which are entirely amenable to ordinary methods of treatment, such as small epitheliomas, the method may challenge comparison of its results with those obtained in any other way." When the well-known scientific conservatism of this observer is considered in connection with his eminent qualifications for judgment in this matter, his statement assumes a most significant aspect, and the reliability of the verdict is rendered still greater by the fact that those who are best qualified to judge agree with him almost without exception.

With cases in which the deeper soft tissues are affected, either with or without involvement of the integument, the attempt to define the therapeutic possibilities is a much more complicated

problem. In this field the attainment of satisfactory results in any reasonable proportion of cases, demands the exercise of the highest development of the art of X-ray therapy, and a good clinical knowledge of the various ways in which deeply-seated malignant processes as well as normal tissues respond to X-light. With this class of cases an operator who has had experience only with the radiographic or fluoroscopic application of the X-ray, is nearly as liable to fail of success as the one who has but just purchased his generator. Deeply-seated cancers have not ceased to furnish even the most experienced of us with material for thought as striking and significant as it is unexpected. It is in this situation that the factors referred to previously as active in obscuring judgment as to limitation, exercise their weightiest influences.

The question will probably not be as to whether or not the X-ray shall be entirely discarded in the treatment of these cases, but as to what extent and under what conditions the X-ray, operative interference, Coley's mixed toxins, massive mercuric cataphoresis, etc., shall be combined in their management. That the agent does exercise a certain amount of beneficial influence in the great majority of them when skillfully and judiciously applied, has been demonstrated beyond the possibility of a doubt. A few cases of even the most deeply located malignant neoplasms have been apparently cured by the X-rays alone and in quite a large number inhibition of further development after extirpation, etc., has seemed to have been the result of their use. Analysis of the cases reported to date, however, does not give us any satisfactory foundation upon which to base a prognosis in any given case, or even in the great majority of cases.

It seems probable at the present time, that it may become necessary in the light of future knowledge to split this category into several subdivisions for consideration of the subject under discussion, according to the location of, and the anatomical structures involved by, the malignant process. For instance, cancers of the lip, involving the muscular elements; of the ear and nose, involving cartilage; of the tongue, breast, abdomen, etc. Authentic cases in all of these situations have been cured by X-rays alone, but in the vast majority reported results have been erratic and unsatisfactory. On the other hand, initiatory extirpation followed by X-ray therapy has many good results

to its credit. The variation in the degree of effectiveness of the agent in different cases is undoubtedly due largely to differences in the degree of skill possessed by the different radiotherapists, but not by any means entirely. Variation in the degree of response in many cases and absolute absence of response in some are observed in the practices of all of us, and the mere depth of the disease below the skin does not satisfactorily account for these variations. In the lip and ear, for instance, the tissues are thin enough to allow of splendid penetration by X-rays, yet treatment of malignant processes in these parts where structures other than the skin have been involved, leaves much to be desired. Differences in the histology of the parts, individual idiosyncrasy, etc., must play a part here which yet remains to be ascertained and defined, hence my belief that this group will have to be subdivided in the light of future knowledge.

In the light of our present knowledge, the procedure of election with the general run of these cases, is initiatory total extirpation if possible, followed at once by a course of X-ray applications.

When the disease affects the lip, ear, nose, or female breast, without metastasis, it is justifiable to apply the X-ray alone primarily, if such a course should seem desirable, carefully watching the growth meanwhile with a view to operating at once if indications of a spread of the disease become apparent. The justification of this course is found in the fact that a number of well authenticated cases of cancer in these regions have been cured by the X-ray alone. By the word "cured" I mean have entirely disappeared, as far as physical examination and subjective phenomena could discover.

In intra-abdominal cases, the percentage which has shown permanent benefit under the rays alone is so small that radical extirpation when possible should invariably be the first step in the treatment, to be followed just as invariably by a long course of X-ray treatments. Practically no evidence is available as to the value of the combined methods in the management of malignant disease involving this region, as the cases which have been submitted to the X-ray therapist have almost without exception, as far as I have been able to discover, presented the aspect of hopelessness, as far as total operative removal was concerned. The fact that a few cases, however small the number, have apparently been cured even under such discouraging conditions

however, speaks extremely well for the power of the X-ray to influence these growths favorably, and affords good grounds for the belief that if they are operated upon early the subsequent application of the ray will enable a considerable percentage of these patients to complete the number of their days without suffering the tortures which have hitherto marked the decline of the victim of hopelessly extensive cancerous degeneration.

There is almost unanimous agreement as to the advisability of using the X-ray after *all* operations for cancer for the purpose of forestalling recurrent tendencies, and upon all inoperable cases. The pain is usually relieved to a gratifying extent, the general condition is usually improved, and lives are prolonged. Whether or not it is desirable to accomplish the last mentioned feat is a matter of opinion and circumstances, but there can be no question as to desirability in reference to the first two.

With regard to cancers involving bone I know of but one operator who claims a cure by this agent, although I have corresponded upon this point with the majority of those who have been doing this work largely, and he knew of but one case. Initiatory operation to be followed by X-ray applications is therefore the only procedure that is justified by the experience recorded to date.

The question of whether or not X-ray applications induce or hasten metastasis, is still sub-judice. Some operators are convinced that they do; others are just as firm in their belief that such is not the case. The lateness of the stages at which most of the cases have come under the management of the X-ray therapist will account for the bulk of the instances wherein metastasis has appeared, and individual idiosyncrasy leading to a lack of response to the beneficial influence of the agent would seem satisfactorily to account for the remainder. It is also significant that the bulk of opinion appears to incline toward the belief that the X-rays do not, per se, provoke metastasis.

The relative merits of coil and static machine as tube excitants are also still under discussion. A belief has gained ground during the past year that the radiance produced by a given tube is identical in its effect, whether excited by a coil or a static machine. Theoretically this might seem to be so, but

the speaker's clinical observation has led him to adhere to the opinion previously expressed, that there is a marked variation in the radiance produced by these two excitants, and that this variation will sometimes be great enough to constitute the difference between success and failure in clinical results with deeply located cases. It is my intention in a subsequent paper, which will be written upon the completion of some observations now in progress along this line, to embody my reasons for this belief in detail, but at present the question is merely a matter of individual opinion.

Opinions as to the proper tubes to use have undergone some modification during the year. The general consensus of opinion now seems to be that those giving off rays of high penetration produce the best results in deeply located growths, and that for superficial growths either high or low penetration is effective. Experience in this direction appears to be confirmatory of the dictates of logic.

Two important points in connection with technique have been brought out since last September. First, steadily-maintained frequently-repeated exposures to the ray extending over a period of many consecutive months, are capable of inducing a cancerous degeneration of at least the superficial areas of the healthy tissue so exposed, which begins as horny epitheliomatous excrescences or indurations, and eventuates in excavating ulcerations with no tendency toward healing. Several X-ray workers throughout the country are suffering from this condition. Second, the belief that a patient who has been "tanned" by the rays cannot be "burned" will have to be abandoned. During the past six months I have had under my care two patients who exhibited the worst cases of X-ray necrosis that I have ever seen. Both were of that class who "tan" readily, and both had exhibited heavy pigment deposits in the parts affected for months before the destructive action was manifest. In one case sloughs were exfoliated three-quarters of an inch thick by actual measurement, and the process of repair extended over a period of five months. In the other the process of repair has already required six months and is not yet half completed.

In conclusion permit me to say that the experience and observation of the past year have only rendered me more emphatic in the expression of my early conviction that "the therapeutic application of the X-ray should be entrusted only to the hands of operators who are skilled and experienced in this particular line of work, as the difference between efficient and faulty technique will frequently constitute the difference between clinical success and failure, as well as between safety and danger to the patient."

REPORT OF THE COMMITTEE ON CURRENT CLASSIFICATION AND NOMENCLATURE.*

(Continued from page 24.)

A Few Experiments with Holtz Machines. By Samuel Sheldon.—The experiments mentioned in this paper were performed with the aid of two Holtz machines. The first was a standard Waite and Bartlett machine having 10 rotating and 5 stationary plates. The second machine was made by the Galvano-Faradic Company, having 8 revolving and 4 stationary plates.

Efficiency.—The efficiency of No. 1 machine and the location of losses were determined in the following manner:

The machine was rotated by means of a belt-connected separately-excited electric motor.

Variation of the speed of the motor was produced by varying the voltage impressed upon its armature.

The power imparted to the armature was measured by means of a voltmeter connected between the armature terminals and an ammeter connected in series with it.

The speed of the motor and that of the Holtz machine were measured with a tachometer.

The speed of the Holtz machine was maintained throughout the test at 315 revolutions per minute.

The motor had a corresponding speed of about 835 r. p. m.

At these speeds the power lost in the motor was determined, by running with the belt off, to be 76 watts.

The power consumed by the tachometer was found to be but 0.42 watts, or a negligible quantity.

The total power consumed, when running the Holtz machine without excitation, was 105 watts.

By subtracting the loss in the motor and neglecting the losses in the tachometer and belt, the loss in the machine due to friction was 29 watts.

After exciting the machine the total power consumption, when the discharge knobs were in contact, was 184 watts, there being no useful output.

The extra loss due to excitation is therefore 79 watts, This will be referred to under the head of internal resistance.

* Read at the Thirteenth Annual Meeting of the American Electro-Therapeutic Association, at Atlantic City, September 24, 1903.

The electrical output when the machine was giving a continuous discharge was equal to the product of the current in amperes by the voltage between discharge points. No. 1 machine was of sufficient size to give a continuous discharge or current between needle points opposed to each other and separated by any distance up to 6 inches. If this distance were exceeded, the discharge became disruptive and the current, which is pulsating in character (see Report of Current Classification, by the Committee, published in the JOURNAL OF ADVANCED THERAPEUTICS, Vol. XXI., No. 1, Jan., 1903, page 31) must have been of very high frequency.

This conclusion is drawn from the following observed facts.

A Weston 150-volt voltmeter of 18,566 ohms resistance was inserted (and used as an ammeter) between a discharge needle point and one of the discharge rods of the machine, as at A in Fig 1.

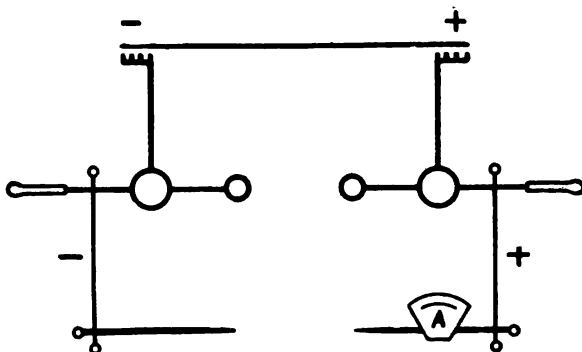


FIG. 1

The connections were supplied with spherical ends. The needles and holders were suspended by silk threads from grooved blocks, which could be slid upon a wooden rod mounted above the machine terminals.

When the needle points were within 6 inches of each other the ammeter needle was quiet and indicated the passage of a current equal to $\frac{1}{18188}$ of an ampere to each unit deflection on the scale.

If the distance between the points exceeded 6 inches, then there was also sparking between the metal parts inside the ammeter, occasioned by voltages which the writer is unable

to account for, except upon the theory that they were due to high frequency changes of current encountering the inductance of the ammeter coil.

In spite of this change in the character of the discharge, from a continuous one of less than 6 inches to a disruptive one of 6 inches or more, readings of that portion of the total output current from the Holtz machine, which traversed the needle-gap circuit and passed through the coil of the ammeter, and simultaneous readings of ammeter and voltmeter input at the driving motor, were made for needle-point gaps up to 18 inches. The actual current output of the Holtz machine at these gap-distances of 6 inches and above, is greater than that indicated by the ammeter readings, because of leakages between the opposite sides of the machine, and around the ammeter coils as above detailed.

The voltage of the discharge for a given gap-distance was taken from Fig. 2.

This is a curve of the relations between voltage and needle point gap-distances in air as given in the standardization report of the American Institute of Electrical Engineers (Transactions, Vol. XIX., 1902, p. 1091 *). The dotted portion of the curve is interpolated and is probably of sufficient accuracy for this kind of work. In order that physicians may not be misled by the foregoing general statement concerning the amount of voltage for given needle point gap-distances, it should be added that the voltages given in Fig. 2 are the *energy* voltages, or the square root of the mean square value of a sinusoidal-wave electro-motive force. The instantaneous *maximum* values of the electro-motive forces for given gap-distances will be 1.414 times greater than the values given in Fig. 2.

*Table of Sparking Distances in Air between Opposed Sharp Needle Points, for Various Effective Sinusoidal Voltages, in inches.

Kilovolts Sq. Root of Mean Square	Inches	Kilovolts Sq. Root of Mean Square	Inches
5.....	0.225	60.....	4.65
10.....	0.47	70.....	5.85
15.....	0.725	80.....	7.1
20.....	1.0	90.....	8.35
25.....	1.3	100.....	9.6
30.....	1.625	110.....	10.75
35.....	2.0	120.....	11.85
40.....	2.45	130.....	12.95
45.....	2.95	140.....	13.95
50.....	3.55	150.....	15.0

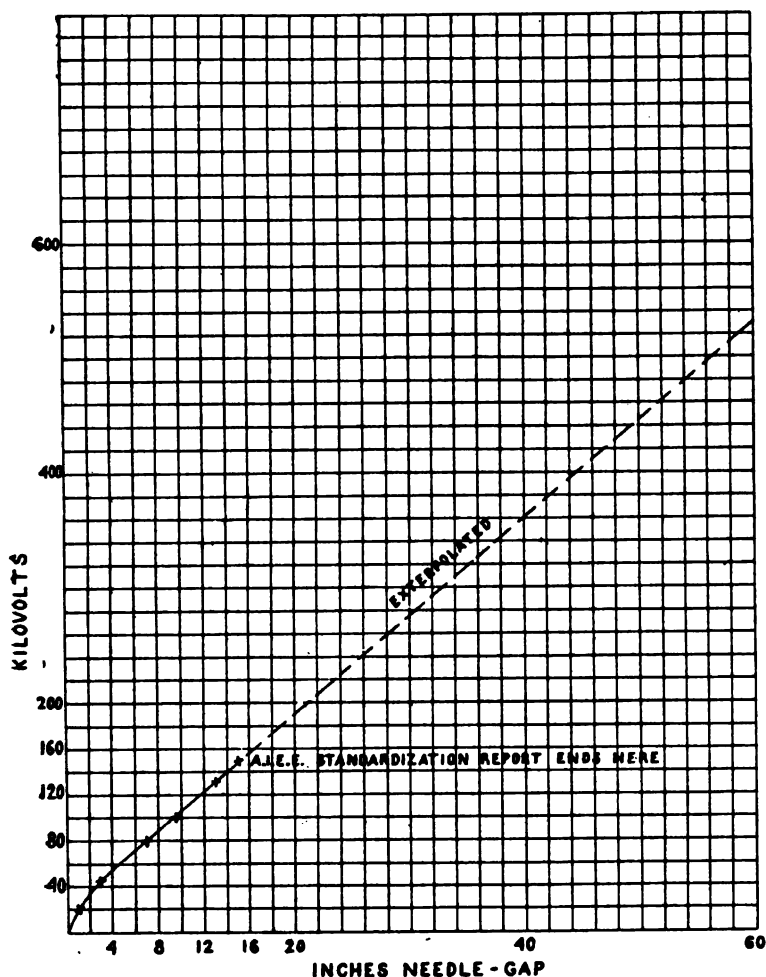


FIG. 2

The available or useful output of the machine is therefore approximately equal to the product of the voltage corresponding to the gap-distance, as taken from this curve, into the currents in amperes, as found by dividing the ammeter reading by the constant 18,566.

The following table, Fig. 3, gives the results obtained; and it should be noted that it shows that when the needle points were brought in contact with each other, and the ammeter coils constituted the only resistance in the external circuit, the voltage output was observed to be 11.1 volts.

Leakage and Internal Resistances.—According to the usual and generally accepted theory of the operation of the Holtz machine, it is not a direct generator of E. M. F., but is a gatherer of electrical charges or electrical quantities, which, in flowing to the various parts of the machine and connected circuits, produce in them differences of potential dependent upon their electro-static capacities. With an external circuit from comb to comb offering a path of finite, constant mean resistance for the expenditure of these differences of potential,

NEEDLE-GAP	POWER SUPPLIED TO DRIVING MOTOR				USEFUL OUTPUT OF HOLTZ MACHINE			EFFICIENCY
INCHES	VOLTS	AMPERES	TOTAL WATTS	NET WATTS	VOLTS	AMPERES	WATTS	PER CENT.
0	82.0	2.00	184	108	11.1	.000597	.0066	0.0
6	96.0	2.10	202	126	71,200.0	.000482	34.0	27.1
12	102.0	2.45	250	174	122,000.0	.000319	39.0	22.2
18	102.5	2.50	256	180	180,000.0	.000194	35.0	19.5

FIG.3

the mean E. M. F. should be proportionate to the speed of rotation.

Hence the machine, after being fully excited, should produce electricity at a mean rate dependent upon and directly proportional to its speed.

Hence further, if operated with its discharge knobs in contact or with a voltmeter connected between them, thus constituting a circuit of constant resistance, the voltmeter, serving in this case as an ammeter, should show a mean current directly proportional to the speed. This is in accord with the following results of experiment:

Speed in R. P. M.	Current in Amperes.
195	.000366
230	.000440
250	.000476
280	.000527
325	.000610
340	.000648
355	.000678
380	.000733
400	.000759

These results are shown graphically in Fig. 4.

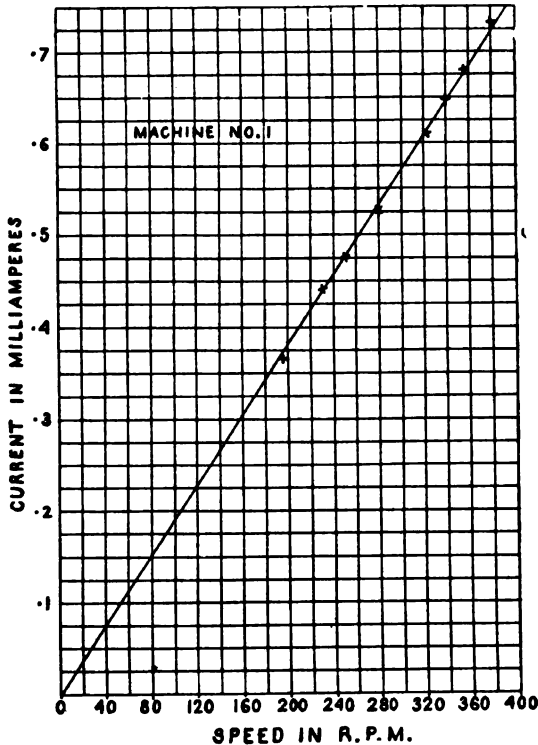


FIG. 4

While the discharge knobs are in contact there is very little difference of potential between the various parts in the main circuit of the machine included between the collecting combs. As the knobs are separated more and more the discharge becomes disruptive, and potential differences are set up, fluctuating from zero to that voltage which is necessary to break down the dielectric between the knobs.

(To be continued.)

LOBAR PNEUMONIA A SECONDARY DISEASE, PREVENTABLE AND CONTROLLABLE, BY PHYSICAL AND DIETETIC METHODS.*

BY MORRIS W. BRINKMANN A. B., M. D., NEW YORK.

(Continued from page 102.)

Let us now consider how the material found in the air cells in pneumonia reaches these minute spaces.

As the blood-vessels subdivide, they form passage ways of minute caliber having walls of great tenuity. These collections of the final minute branches of the pulmonary blood-vessels, the so-called capillaries, are arranged around the exceedingly thin walls of the air vesicles in such a manner that the interchange of gases from the air cells and blood-vessels shall be as rapid and thorough as possible.

When the extreme delicacy of construction of this arrangement is grasped, one at once realizes that nature has arranged wonderfully and simply to maintain this fine structure in its proper form by pneumatic support, and when this pneumatic support in the air vesicle is removed, the pressure of the blood in the surrounding capillaries being no longer resisted as it should be by the pneumatic support of the residual air, a distention of fine tubes takes place with thinning of the vessel wall on account of the accumulating pressure within the blood-vessels. Through minute openings in the vessel wall and in other ways, an exudation of the w. b. c. or leucocytes develops and goes on until the plugging of the air vesicle cavity forms a mechanical support to the air vesicle walls. We have now reached a point where we realize that this exudation is really a conservative process, in fact, preventing numerous tears and possible hemorrhages as well as collapse of lung. In certain cases some of the r. b. c. also manage to get through the vessel wall, the quantity of r. b. c. escaping through the minute openings determining always the amount of discoloration in the sputum. This is not however a true hemorrhage. It is to be regarded as a leak allowing but few r. b. c. to transude, so-called diapedesis.

* Read before the Clinical Society of the New York School of Physical Therapeutics, Friday evening, December 18, 1893.

Physiologists agree that a portion only of the breathing capacity of the lungs is utilized, and one therefore readily understands that a very considerable amount of the breathing capacity may be removed before difficulty arises. There is no exact agreement as to what the percentage of unutilized respiratory function is. Roughly however, and sufficient for practical purposes, it may be stated to be 1-3. The main factor to be grasped as to the lung exudate, in the writer's view is the removal of the pneumatic support of the delicate air cell walls and blood-vessels.

The other phenomena of lung inflammation are all explained by the conditions found in the abdomen and lung, pain being due to pressure of the lung substance by the exudate, as also of the consolidated lung against the nerves of the thorax, etc., etc. Circulatory troubles are due to the resistance offered to the blood flowing through the lungs as also the mechanical compression of the heart muscle.

Fever in this condition, according to the writer's view, is unquestionably the result of absorbing infection from the stomach and bowels.

It may be asked and justly so, why a particular lobe or lobes of the lungs are involved? The answer to this is contained in the fact, that the particular portion of the lung involved depends upon the particular direction in which the pressure is exerted. A thickened liver of necessity pressing upon the right lung, whereas a thickened spleen presses against the left lung. A highly distended stomach presses both liver and spleen upwards. Spasm in the pharyngeal constrictors or upper circular esophageal muscular fibers which would prevent the eructation or belching of gas contained in stomach and esophagus, would distend the latter and thus compress the internal and posterior surfaces of both lungs.

The pleuritic pain and inflammatory trouble would be explained by the pressure of the lung against the chest wall by compressing the intercostal nerves and vessels, and so produce all the symptoms of pleuritis.

Observers accustomed to investigate the alteration of position of liver, spleen, and stomach during respiration by means of the fluoroscope and X-ray know the great variation of this movement in health and disease. Especially is this noteworthy when there is considerable distention of the intestines or where

the intestines are floated up by ascitic fluid. In health, one commonly sees the liver rise four inches in expiration and descend the same amount in inspiration (in an adult of 5-7"-5-9"). When intestinal distention or pressure exists this rise and fall may become 1-2 inch or even nothing. One also occasionally sees the upper margin of the liver and spleen as high as the lower border of the third rib, the organ or organs being much enlarged, in addition to which a concomitant pressure from below elevates them to this unnatural position. We have now reached a position where we can intelligently say that pneumonia is due (1) to a mechanical pressure upon the lung substances; and (2) by depriving the lung of its physiological necessity of space for expansion.

Holding such views we naturally endeavor to relieve our patient by reaching the primary condition. The chest and lung are therefore not disturbed in any way by treatment. The one need for the lung being room for expansion, or expressed otherwise, being pure air.

We proceed at once to employ measures for decreasing the pressure upwards against the diaphragm in order that the lung may expand. The moment we have made a gain here there is an immediate improvement in the condition of our patient. When the natural vigor and tone are again present in the digestive tube, and we have this evidence in normal evacuations from the bowel, there will be no abnormal elevation of the temperature, and the exudate into the air cells will commence to soften and disappear, in other words, be absorbed. I have quite frequently found pulmonary exudate present, with no fever, no pain, very little disturbance of the circulation and a surprisingly slight acceleration of the breathing. I have never seen more than two or three days at the most necessary for complete absorption of the exudate after the bowels were normal.

No extended argument should be required to prove the need for pure air as it is a physiological necessity.

A vitiation of 1 per cent. in the air compels one breath extra in a hundred, and the imperfect air furthermore poisons the whole body, being carried through the whole organism by the blood.

If 30 cu. in. are used normally per respiration and at the rate of twenty respirations per minute, there would be 600 cu. in.

used in a minute; that is, deprived of its oxygen. In three minutes there would be more than 1 cu. ft. destroyed. In a closed room, 10 × 10 × 10 ft. vitiation would be .1 per cent. in one minute and in 1-2 hour 3 per cent. When two persons are in a closed room of the same size the vitiation would be double or 6 per cent. in 1-2 hour. During a night of eight hours, it would be for two adults 96 per cent. The light necessary would make the necessary difference to completely destroy the vital properties of the contained air. When a fire is in the room the vitiation would be much more rapid. One night under such circumstances would positively destroy any individual, even the most robust. Any degree of impurity in the air being admittedly injurious to the well, how much more so must it be to those suffering with respiratory difficulty?

Reason, therefore, teaches that the only safety consists in opening the windows, opening them wide, and having a current of fresh air through the sick room, not necessarily blowing over the patient.

A chill occurring in any individual with the abdominal and thoracic conditions already described, is to be viewed with concern only in so far as it requires immediate attention.

The severity of the chill will be found proportioned to the intensity of the fever about to ensue. The cause of the chill is to be viewed as an entrance into the blood of toxins absorbed from the bowels, and is the inception of the fever process.

The chill stage is treated by covering the patient heavily to the armpits and surrounding him under the blankets with hot-water bags wrapped in hot, well-wrung wet cloths in turn wrapped in dry flannel. The most rapid reaction can be accomplished by means of a vapor-bath cabinet. By the latter means from 5 to 15 minutes will give the necessary result, depending upon the severity of the rigor. I should warn against hot drinks, as even when the mouth temperature is low there is already an abdominal rise, as proven by the rectal temperature, taken simultaneously with the oral.

Prompt and energetic evacuation of the bowels with large enemata, employing soapy and sudsy water when necessary. The systematic use of the hip bath, using the clinical thermometer as a guide, for stimulating peristalsis as well as for controlling fever is indispensable; furthermore, its action is highly beneficial in preventing unnecessary and persistent ex-

haustion of the abdominal nerves due to continued elevation of temperature, until bowel action is better.

The advantage of the sitz or hip bath are numerous.

1. The cooling or antipyretic action occurs exactly where it is required.

2. Reaction occurs into the intestinal and abdominal vessels, in a direction away from the chest, necessarily relieving pulmonary congestion.

3. Shock can be absolutely prevented, inasmuch as we can commence our bath at a temperature approximating that of the patient, and by gradually reducing the temperature until we reach the minimum desired. In ordinary cases 78° F. would probably represent the lowest temperature required.

4. The patient is in a restful and quiet position during the bath, as friction and manipulation are unnecessary, as would be the case in the half bath.

5. Surface chilling of the non-immersed parts is prevented by covering the patient and hip tub with a blanket, thus avoiding surface radiation and contact with air currents.

6. The feet can be warmed by immersion in a warm or hot foot bath during the progress of the cooling procedure.

In obstinate cases, small icy retained enematas are a useful adjunct; at times, but rarely the colon tube may be found necessary.

A few remarks on diet are imperatively called for. Until space has been gained by intestinal evacuation, gaseous as well as solid; food will aggravate the primary cause (1) by taking up abdominal space and (2) when digestion is imperfect becoming a further cause for trouble by decomposing and generating gas, thus aggravating just what should be prevented. Instead, therefore, of attempting to maintain our patient's strength by feeding, we must avoid this very thing—to save his strength by keeping gastric and intestinal decomposition at the minimum. The patient instinctively avoids food and rebels at feeding, his instinct is absolutely correct. His weakness is due to (1) a transformation of vital energy into heat (fever); (2) nerve poisoning from toxins absorbed from the bowel; (3) lack of proper energy due to lack of oxidation from imperfect air supply.

Especially to be avoided are all nitrogenized foods—meat, eggs, fish, cheese, milk; and broths containing them. The

products of these bodies when undergoing putriferous decomposition are of a highly poisonous character. Milk especially must be avoided. It is swallowed as a fluid, becomes precipitated as casein, leaving the whey free for absorption. My experience is that this casein traverses the bowel almost unchanged during impaired digestion; if any change does occur it is in the direction of putrefaction. In these disturbed intestinal conditions one can constantly see it in the stools, very slightly altered, at times compacted into dense, hardened masses. The intestinal decomposition of casein is certainly a factor of importance in milk fed pneumonia patients, as well as it is important in a long list of other acute conditions.

My own practice is to give foods which will mechanically stimulate the bowel and which will not form dangerous compounds. When digestion is unable to properly prepare them for absorption, I give oatmeal, graham bread; fruit, raw, stewed or baked; leafy vegetables; green salads; depending mainly upon the fact that a small quantity may be very well digested and assimilated, while the larger quantity is food for decomposition but not for nutrition. Water to be drunk freely.

Theoretical considerations embracing:

1. Neuro vasomotor disturbances as causative factors.
2. Involvement of the central temperature mechanism.
3. Phagocytosis.
4. The use of symptomatic therapeutic procedures.
5. Treatment of other and disassociated organs.
6. The use of any chemical or medicinal agent whatsoever.

All of these as well as other conceptions not bearing directly on the issues involved in a practical way have been discarded one by one. Experience covering almost twenty years having led up step by step to the writer's conception of the subject under consideration.

Experience has demonstrated that lobar pneumonia need not develop when the primary conditions are treated on the principles described.

Experience also teaches that it is not to be feared. My results have been so satisfactory that I feel a sense of security in even so-called desperate cases.

Can more than this be said of the treatment of any condition of disease and suffering; to recover health surely, speedily and pleasantly?

A NEW SYSTEM OF "HIGH FREQUENCY" THERAPEUTICS.

BY FREDERICK F. STRONG, M. D., BOSTON, MASS.

Introductory Article.

In presenting this series of articles to the profession, the writer feels no little satisfaction in the consciousness that a complete system of technique has been developed and thoroughly tested during a number of years, before being committed to paper for publication. American medical literature, especially that portion which is confined to the journals, reviews, and annual society reports, has the reputation of being deplorably unscientific. There is a tendency on the part of our investigators in medical science to "rush into print" on the slightest pretext, and to confuse personal opinions and hypotheses founded upon insufficient objective evidence, with logical deductions from carefully compiled and co-ordinated data resulting from repeated observation, and conservative experiment.

The American medical scientist usually has, as Kipling expresses it, "too much ego in his cosmos." The reason that medicine is so slow in developing into an exact science, is the large part played by the "personal equation" in the gathering together of material as a basis for the deduction of working hypotheses, or of permanent conclusions. The empiricism which must always taint, to a greater or less degree, our methods of practice deduced from clinical observation and experience gained at the bedside, is absent, or should be, in the methods adopted in other branches of scientific investigation.

In electro-therapeutics, we have a "hybrid" which admits neither of the exact methods of investigation in which the "personal equation" is eliminated, nor are reliable conclusions to be obtained by the sole employment of the "clinical methods," upon which most of our present therapeutic systems are based. The skepticism of the more conservative members of the medical profession in regard to the value of electricity as a healing agent, has been justified by the host of conflicting statements, rash claims, and imperfect deductions of misguided enthusiasts whose methods might have been correct and appropriate if used in gathering information from the observations

of daily medical practice, but which lacked the impersonal objective methods of pure physical science.

The modern science of electro-therapeutics which is slowly emerging from the confusion of misstatements and personal ideas which have, until recently, made up the literature of the subject, is being evolved through the careful laboratory work and conservative clinical studies of those investigators who combine the careful training of the scientist with the more strictly personal and intuitive perceptions, which are so characteristic of the successful physician.

In venturing to offer to the profession what he feels justified in denominating a "new system of high frequency therapeutics," the writer believes that the important results, which it is the purpose of these papers to describe, have been tested and verified by strictly scientific methods, and statements and deductions founded solely upon personal belief or preconception, have been eliminated in every case.

The system comprises the following contributions to the physician's equipment:

A form of high frequency current, differing from those produced by the resonators, solenoids, and transformers in use at the present time, being more powerful, regular, of greater frequency, and higher vitalizing or health-producing characteristics, and being susceptible of a much wider range of applicability and general usefulness, than any other single therapeutic agent that is known at the present time.

Second. An apparatus for the economical generation of the above current, adapted for use on the usual electric lighting circuits, capable of producing all effects obtained by the use of the static machine, the faradic, sinusoidal and cautery apparatus, and giving therapeutic results impossible to obtain from these, or from the usual high frequency resonators and solenoids. In addition to the above, the new apparatus will yield X-rays equal, and in many ways superior, to those from any coil or static machine, and is the only satisfactory X-ray machine that has yet been produced for use with the alternating electric lighting current. When we consider that heretofore physicians living in cities supplied with the alternating current, have been obliged to employ expensive motor generators and current reversers in order to operate X-ray apparatus, the scope of the new machine in this particular field may

be partially realized. It is also adapted to the production of the "ultra-violet light," and yields rays of greater power than those of any other apparatus employing the condenser discharge for "ultra-violet" generation. The perfected machine is the only therapeutic high frequency apparatus on the Tesla principle. The details for the construction of an apparatus such as the writer is now using, will be given next month, in the second article of this series.

Third. A simple system of regulation, by the use of which currents of high frequency may be controlled and modified for the production of the effects ordinarily obtained from the static machine, faradic coil, etc. European authorities on high frequency therapeutics state that muscular contractions cannot be produced by the currents of this nature, yet the writer's system of regulation enables one to produce muscular contractions and massage effects of any desired intensity and frequency.

Fourth. A large number of special methods adapted to facilitate the application of the high frequency current to different parts of the body for the production of a wide range of effects. Chief among the instruments devised by the writer for the above purposes, during the past eight years, are the various electrodes, inclosed in, or consisting of, glass. The discovery of the value of treating through glass was made by the writer early in 1897, and demonstrated in the latter part of the same year, in a number of lectures and papers presented at medical society meetings. Vacuum electrodes were first suggested and employed by the writer in the autumn of 1897. The first regularly constructed vacuum electrodes for the therapeutic application of high frequency currents were made and demonstrated by the writer in an illustrated lecture before the faculty and students of Tuft's College Medical School, in February, 1898, and similar electrodes have been used by him continuously to the present time. While the writer's numerous devices and inventions for the generation and use of high frequency currents have been familiar to Boston physicians for some years, there are many others to whom the statement that vacuum electrodes, for example, were devised and employed in giving high frequency treatments during 1898, will come as somewhat of a surprise, more especially as in 1901 a patent was granted to certain parties for vacuum electrodes, and the drawings in the

patent specifications were strangely similar to electrodes that the writer had been using for a year or more prior to the date of the patent. A somewhat similar coincidence occurred within the last few months, when Dr. Mount-Bleyer described in the Medical Examiner a series of experiments with "ultra-violet light," in which he illustrates a special monopolar vacuum tube, having a quartz window opposite an aluminum cathode, and describes it as the "Mount-Bleyer Ultra-violet Tube," to be used with a static or high frequency apparatus for the generation of ultra-violet light in treating skin diseases. Had Dr. Mount-Bleyer looked up the Patent records, he would have found the description of a tube almost identical with his, in the specifications of a patent taken out by the writer, over a year ago, and assigned to Mr. Frank H. Swett, who made the first tubes of this kind from the idea suggested by the writer. In the next article the writer will describe in detail the technique of his various methods of high frequency treatment, and the electrodes that are used in connection therewith.

Fifth. Finally, the writer will present a summary of over four hundred cases treated by him during the past eight years, and in which high frequency currents were employed therapeutically, with almost invariable benefit to the patient. The final article of this series will be devoted exclusively to clinical reports selected from a large number of cases, embracing a wide range of pathological conditions. The results of treatment have been so invariably beneficial, and in some cases, so very remarkable, that the writer has withheld their publication until the present time, when a number of physicians are using the apparatus of the type described, and employing the writer's methods in treating their cases, and arriving at similar conclusions regarding the value of the writer's system of high frequency therapeutics.

Next month's article will consider the details and principles involved in the construction of the writer's apparatus. The use of the X-ray tube, excited from the high frequency apparatus, will also be considered in the next article, and several entirely new points that have been evolved through the use of this combination, will be explained.

ON THE PHYSIO-PATHOLOGICAL ACTION OF THE HIGH-FREQUENCY AND HIGH TENSION CURRENTS ON THE NORMAL SKIN. HISTOLOGICAL RESEARCHES.

BY DR. G. ARIENZO AND DR. S. FABROZZI, NAPLES, ITALY.

The possibility of the production of high-frequency and high tension currents and the physical conditions in which they were produced were known before the interesting communication of d'Arsonval and Tesla.

Helmholtz was the first, in 1847, to assert that the discharges from the Leyden jar can be in certain cases oscillating, and not always instantaneous. Henry, Berstein, Becquerel, and others accepted Helmholtz's opinion, but the experimental demonstration of the oscillating character of the condenser's discharge was given by Federson, a Danish physician, in 1850.

The physical fact encountered remained isolated, when, in 1878, Hertz, taking up again William Thomson's experiments, demonstrated the possibility of checking the oscillations by means of an induction coil, and how the electrical effects of these oscillations propagate themselves at a distance, similarly to light.

In the same year, d'Arsonval, studying the mechanism of electrical excitement of the nerves and of the muscles, had proposed to inquire in what way the physiological effects modify themselves, gradually augmenting the frequency. To augment the number of the interruptions, he used an interrupter of Gramme's pattern, with which he obtained up to 10,000 interruptions per second. He could ascertain then that the action on the neuro-muscular system augmented up to 2500 or 3000 interruptions, and then decreased progressively and slowly.

From that moment, d'Arsonval thought that with a much greater number of interruptions the general sensibility and the muscular contractility were probably now more influenced.

On the other hand, Ward, Spottiswode's assistant, noticed, in 1887, that the spark of a Rumkorff coil is inoffensive when the interrupter of said coil can produce 6000 interruptions per second.

The possibility of applying on the human body high intensity currents that became entirely harmless by the transformation of the intensity in potential was then thought of. Tesla, at the Society of Electrical Engineers of the United States, and d'Arsonval at the International Electricians' Society in Paris, showed that it was possible to touch with both hands, the bottle united to the high tension coil without receiving any damage, though the energy of the current was such as to bring to incandescence a number of electric lamps of a special system.

Tesla and d'Arsonval having demonstrated that harmlessness, Oudin created some special contrivances, and from that moment the real study of the physiological properties of the high-frequency and high tension currents began in earnest.

As to what concerns, the auto-conduction that is obtained by using the big solenoid of d'Arsonval, the works of d'Arsonval himself, of Bergonie, of Vigoroux, of Doumer on the extraordinary activity that the high-frequency currents give to the nutritive exchanges and to the cellular life, of Tripet, of Guillaume on their action on the breathing and on the activity of the exchanges between blood and tissues of Denoyes, Martre, Rouvier on the action of said currents on the urinary secretions, of Dinutriewski on the elimination of phosphorus in consequence of the action of poisons submitted at first to the action of these currents, of Harigliano on the transmission of said currents to the human organism, of Apostoli on the results obtained in the treatment of obesity and diabetes, of Reale, de Renzi, Vinai and Vietti, Bordier, Lecomte, Bonniot, and Guerton, on the action of said current on the exchanges, of d'Arsonval, of Mamier, Bonomo, and Viola, Dubois, Thiele and Wolff, Doume and Oudin, Lagrifoul and Denoyes, Sudnik, on the bactericidal influences of these currents, all, in a more or less precise way, have demonstrated what therapeutical resources can be expected to be obtained from the use of high-frequency and high tension currents.

The electro-therapeutists, especially after the discovery of the resonance effluves of Oudin's resonator, have applied it in diverse forms of dermatitis, surgical tuberculosis, etc. Coignet first published two cases of cancer, in 1896, cured by this method. Later, thanks to the works of Oudin, Bandet, Bollaen, Sudnik, Bisserie, Doumer, Bordier, and others, the field

of the local applications of high-frequency and high tension currents was vastly sowed. All the authors report a large number of cases crowned with a more or less brilliant success. It is not possible to attribute results always to bactericidal power or caustic action, all the authors having contented themselves to ascribe their therapeutic successes to a specific power peculiar to the high-frequency and high tension currents.

Only in the work of Ledue and of Oudin is there an allusion to the possibility of histological modifications, induced in the tissues, these two authors having noticed that a spark from a resonator or a big solenoid, applied on whatever place on the skin produces, around the point of application, an area of one or two c.m. of anæmia, the skin becoming of a dull white color, which is quickly followed by an erythematous red. This study, notwithstanding the diligent researches in the literature, has not been pursued or more deeply investigated by other authors. It is easy to convince one's self that when it is not possible to consider bactericidal power the recoveries obtained by means of the use of high-frequency and high tension currents are due to the modifications induced in the tissues.

We have thought it right to report our investigations of the histological modifications that can be observed when applying the effluves of the Oudin resonator and the spark directly. This was obtained by applying the wire coming from one of the coils of the solenoid to the skin of animals, and observing the way in which the epithelium behaved in proportion to the process of repair before undertaking the study of the alterations and modifications induced in the tissues in special pathological conditions. The contrivance we used is that which has been for three years in the studio under the direction of Professor Piccinino to whom we proffer our most sincerely felt thanks for having put everything at our disposal.

It is composed of a big Rumkorff coil (capable of emitting sparks 50 in. long) provided with a rotary mercury interrupter which is put in communication with the interior armature of four large Leyden jars, with a large solenoid (of the d'Arsonval model that is generally used for the auto-conduction phenomena) and of a resonator (medium Oudin model.) The sparks of the solenoid were obtained by putting one wire in the center of the solenoid itself. For those of the resonator, on the two wire presses in communication with the Leyden

jar, a small solenoid was put, in which was an internal coil, and at the extremities of that same solenoid were attached the two wires; the thirteenth coil of the resonator's spiral was never surpassed.

The intensity of the current was 3 to 4 amperes.

Experiments.—The animals used for the experiments have been rabbits, twelve in number, that is to say, six for the Oudin resonator and six for the high-frequency.

The experiments have been made to the whole skin of these animals, to different parts of the body, abdomen and back, and the effluve was applied first for a certain variable time; that is to say, after twenty-four hours first for one period of twenty minutes, and gradually increasing up to five days, the effluve being always made to act for twenty minutes every day. Afterwards, a change that appeared after the application of the effluve for five days was observed, and, for the several periods pieces of skin were taken and submitted to an accurate observation.

The small pieces of skin taken were variously fixed, but chiefly in absolute alcohol, in Zenker's liquid and in Müller's fluid, and after preparation for dehydration and diaphanisation, they were put in paraffine. The microscopical cuts obtained were fixed on slides, and differently colored, carmine and hæmatoxylin being used, simply or in connection with eosin and orange G. and pure acid, besides the triacid of Ehrlich for the specific coloration of the blood and its components.

The following are the results of our researches, the first showing the macroscopic alterations that were observed on the skin after the electrical application, and afterwards the different changes that we were able to discern with the microscope in the specimens we had obtained.

The Oudin Resonator.—Rabbit No. 1.—Application of the effluve for twenty minutes on four points of the skin of the back and abdomen. After twenty-four hours, a perceptible reddening on the point that had been treated could be noticed. The pieces were then taken off, fixed, and colored in the way above indicated.

In the preparations so obtained, a hyperæmia of the capillaries of the skin and of the subcutaneous connective tissue, with a slight infiltration of red blood corpuscles, mono and polynuclear, especially eosinophile in the subcutaneous connective tissue were found. In the different layers of the skin, alterations were noticed, especially in the horny layer, in the form of maximum exfoliation, whereas in the cells of the underlying layers the signs of a beginning necrosis were found. In fact, the nucleus is more homogeneous in general points with small internal voids.

Rabbit No. 2.—Application of the effluve for two consecutive days and for twenty minutes at a time. After forty-eight

hours, on the place there was a marked reddening with the commencing formation of a crust. We then took the pieces off and in the preparations were observed the following: The horny layer was entirely destroyed, and in its stead a finely granulated substance consisting of the disintegration of the first layer of cells of the epithelium. In the epithelial cells, necrotic alterations much more accentuated than in the preceding case, were observed, with infiltration of blood corpuscles (leucocytes) in several points, while in others, the protoplasm had lost its identity and was firmly incorporated with that of the surrounding tissues, which, in their turn, presented the same characteristics, so that in these points it seemed that several cells had been fixed together forming a larger element, in which, though, the nuclei had lost also the specific character of the single elements, appearing in a grade more or less advanced of mitosis or karyokinesis.

The leucocyte infiltration in the subcutaneous connective tissue was much accentuated and invaded in many points the glandular layer, while in several layers it weakened the elements of the *erectores pili*. In that layer, a much accentuated hyperæmia was observed, and in several points were noticed capillaries broken and with a slight extravasation of blood in the meshes of the connective tissue.

Rabbit No. 3.—Application of the effluve for twenty minutes per day for three days. At the place of application, an adherent crust was observed, curved inwardly like an umbilicus, while in the margins was noticed a certain grade of hyperæmia.

In the microscopical cuts made at that time can be observed: necrobiosis of almost all of the cutaneous epithelial layer, a slight layer alone remaining, very deep with a few papillæ, the elements of which are also altered and on the way to necrosis. Even the glandular layer is more or less altered and altogether produced that crust microscopically noted, which undoubtedly is formed of granulations formed by the granular degeneration of the destroyed epithelial elements and held together by the circulatory plasma and coagulum. The leucocytic infiltration, in the subcutaneous connective tissue is maximum and appears almost as if it involved the necrotic portion of the epithelial layers. It extends to the surface, and several leucocytes could be seen in the protoplasm as blackish points coming from the granulations at the points in necrosis. The hemorrhages are very noticeable in the subcutaneous connective tissue at several points, even the extravasated blood had undergone the involutive phase of granular disintegration. The deposits of yellow granulations appear in these layers, reacting perfectly with the Cemosiderine reaction.

Editorial.

RADIUM AND THE X-RAY.

THE general discussion in the medical and lay press concerning the wonders of radium, and the allied substances thorium and polonium, has aroused the public and the professional expectations to a pitch unwarranted by the results so far obtained.

As a matter of fact radium does not possess the power of penetration of the X-ray, which limits its field to the more superficial conditions. The blending of the three distinct radiations which characterize this remarkable substance may adapt it to the successful treatment of certain conditions in which the X-ray does not succeed so well. On the other hand, it is probable that this very combination is certain to prove an objectionable feature.

As demonstrated the most penetrating of the radium rays, the γ rays, are analogous to the X-rays, which explains the similarity of their action.

Observation to the present time has failed to demonstrate any striking advantage of radium. In a few instances its employment in association with the X-ray seems to have produced a better result than from the latter singly.

As to the probable therapeutic value of the internal administration of fluids rendered fluorescent by radium there is little to be expected, as solutions so affected lose that property when new chemical combinations are formed. At the present time those who have become familiar with the valuable therapeutic properties of the X-ray are not likely to set it aside for radium. In the superficial cases when the X-ray for reasons has failed, and in others, radium may assert superior effects and win a valued recognition. It deserves a thorough trial but must be employed with great care and discrimination.

* * *

MECHANICAL VIBRATION THERAPY.

A REMARKABLE interest is manifested in therapeutic administration of mechanical vibration therapy by the new and valuable apparatus that are now being put upon the market.

No physician's office, either the general practitioner or specialist, can be considered to be completely equipped without an efficient apparatus for administering vibration treatment.

These machines when properly constructed and used with due regard to technique in selected cases have much wider range of therapeutic application than is recognized by most physicians. Their field of usefulness includes not only vibratory impulse but the provinces of massage held by percussion, friction, and stroking; and when properly applied either alone or in conjunction with joint stretching, assistive or resistive motions, electricity, or hydrotherapy, as the case indicates, will yield most promising results.

* * *

THE WORK OF THE COMMITTEE ON CURRENT CLASSIFICATION AND NOMENCLATURE.

THE Committee on Current Classification and Nomenclature of the American Electro-Therapeutic Association solicit hints and suggestions from members of the profession which will assist them in the difficult task which they are carrying out in behalf of establishing an accurate and scientific classification of electrical currents and a uniform and correct nomenclature. We trust that this will obtain general recognition and adoption.

We have every reason to believe that the results of their unselfish labors in behalf of electro-therapeutics will meet with hearty approval and general adoption.

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DR. CLEAVES' series on The Therapeutics of the Continuous Current does not appear in this issue, but will be resumed subsequently.

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WITH this number of the JOURNAL we are beginning the publication of a series of papers by Dr. Strong of Boston upon the absorbing subject of High Frequency Currents.

Progress in Physical Therapeutics.

CURRENTS OF HIGH FREQUENCY AND HIGH POTENTIAL.

EDITED BY WALTER H. WHITE, M. D.

There are three principal methods employed in obtaining electrical currents of high potential and great frequency for use in therapeutics.

First, by means of the D'Arsonval solenoid. Second, by the use of the Oudin resonator. Third, by the employment of a combination used by Tesla in his experiments.

We will consider very briefly these three methods, and endeavor to understand the relation between them.

The first, and by far the simplest method of the three, is that used by D'Arsonval. It has long been known that the discharge of a condenser, such as a Leyden jar, is not simply one flash, but is composed of a very great number of separate sparks or discharges. It was also found that by placing a suitable coil of wire in circuit with the condenser, the electrical effects in the circuit could be very much increased. This was found to be at a maximum when the condenser and the coil, or inductance, had such proportions as to give what is called resonance. That is, the best effects were obtained when the circuit was tuned to a particular frequency or wave length. In practice, this tuning was accomplished by arranging the apparatus so that more or less of the solenoid could be thrown into the circuit at will. The condenser was usually constant, while the inductance, in the form of an open coil, could be varied until the critical frequency had been obtained.

The second method is that of Oudin, who made several important improvements on D'Arsonval's original apparatus. The most important of these improvements, was no doubt the addition of a resonator to D'Arsonval's solenoid. This was simply a coil of wire with one end attached to the solenoid. Later the solenoid and resonator were wound on the same drum. That is, the resonator was really a continuation of the solenoid.

The effect of this improvement was to still further raise the

potential, or electrical pressure, of the high frequency current. The resonator responded to the waves set up in the solenoid in very much the same manner that an ordinary sound resonator responds to a tuning-fork of the proper pitch. Then again, to carry the comparison still further, just as the volume of sound is increased by the addition of the sound resonator, so the voltage in the electrical circuit was increased by the addition of the resonator of Oudin.

The third method, that employed by Tesla, is somewhat similar to the other two. To get the maximum effect Tesla also employs the principle of resonance, that is, of tuned circuits. His method of increasing, or stepping up, the potential is different, however, than that used by Oudin. In the Tesla system the solenoid of D'Arsonval is surrounded with a second solenoid having many more turns of wire. This is called the secondary solenoid, or usually simply the secondary coil. In some constructions, and in fact most of the modern constructions, this secondary coil is within, instead of without, the primary coil. This secondary coil has no electrical contact with the primary, any more than the secondary of an ordinary induction coil has contact with its primary. The action of the one coil on the other is due to induction.

Although many foreign specialists have condemned the Tesla system as a means of generating oscillatory currents for use in therapeutics, for the reason that the output of the apparatus has been of such a large amperage, and without a suitable means of controlling it, that the patient was terrified at the sight of a long series of sparks and the noise made during operation. By reducing the spark length and retaining or increasing the potential as in the apparatus used by the author, this difficulty has been counteracted, and it now appears that this is to be the coming method of obtaining these currents.

Electrically speaking, it is far more efficient than either of the other two methods. It is also more compact, and far more general in its application. Perhaps the best way of considering this method is to take as an example the apparatus of modern construction, which makes use of this method in generating these currents of high potential and very great frequency. It is useful not only in producing high frequency currents for therapeutic uses, but is well adapted for producing currents which are used in the production of the X-ray. It is

only recently that the high frequency apparatus has come forward as an X-ray machine, this field having been almost entirely monopolized by the induction coil, and to a lesser extent, by the static machine. When the direct current is obtainable there is no doubt but that the coil is still the most powerful means of exciting a Crookes' tube, though remarkable results have been obtained with high frequency apparatus when using the direct current as a source of energy. Where the alternating current is in use, however, the high frequency apparatus gives at once a most powerful as well as a very simple means of generating currents for X-ray work. It is when running on the alternating current that the high frequency machine is shown at its best as a producer of the Roentgen Ray. Where the high frequency currents are desired for therapeutic use the direct current machine is as well adapted as the alternating current apparatus. It is only in the heavier X-ray work that the latter shows its superiority. The character of the discharge in this apparatus is capable of alteration from a low power of about one ampere in the primary to a high power of four or five amperes. The frequency is also changed from a "low frequency" (which is about the same as some other makes of the high frequency machines) to a much higher frequency, so that there is a wide range for operating. The discharge between the terminals varies from a series of fine sparks to curling rods of a violet color, the discharge can be made to assume the character of the discharge given off by the modern static machine. The energy available in the outside circuit can also be changed from an absolutely imperceptible amount, up to the full output of the machine. In order to give some slight idea of this energy the following experiments are cited. If an ordinary 16-candle power incandescent bulb be grasped in the fingers so that the body is put into contact with the shell of the lamp socket, and the other contact of the socket be placed against one terminal of the secondary coil of the Tesla transformer when the machine is in operation the lamp will be lighted nearly to full candle power. The lamp is connected to only one terminal, the other not even grounded. What is more the energy which is lighting the lamp passes through the body of the experimenter without giving rise to the slightest sensation. The frequency is so high that the nerves do not respond to the stimulus.

Another experiment of a similar nature, though if anything more remarkable, is to grasp a piece of iron wire with a pair of pliers or forceps, and allow the discharge from the machine to pass to the free end of the wire. In this case the wire will melt and run off on the floor. Platinum wire of smaller size, may thus be melted. This, as in the previous experiment, is on only one pole of the machine, and with no sensation to the person concerned.

Instead of using the current from the secondary of the high frequency transformer, if the current from the primary be used, still more powerful effects are produced. A 50-candle power lamp of commercial proportions may be blown out and utterly destroyed by simply placing it in this primary circuit.

As another example of the remarkable properties of these currents, it may be stated that a person can place one hand on each of the high potential, high frequency terminals of the machine, and though the machine be turned on to the utmost there will be no sensation, other than a warmth at the point of exit and entrance of the current. And yet the machine working at the same power might melt the platinum anode of an X-ray tube without difficulty! This is an experiment that has been tried often, and as yet no ill effects have been noticed. The results from the use of high frequency machines have been of such brilliant character that we are glad to welcome it as another mode of operation in electro-therapeutics.

In this department of high frequency therapeutics we shall be pleased to have reports of cases from various parts of the country and trust that the writers will state the style of machine used to generate these high potential currents in the cases reported.

LARYNGOLOGY, RHINOLOGY, AND OTOLOGY.

EDITED BY W. SCHEPPEGRELL, A. M., M. D.

Vitality of Bacteria from the Throats of Scarlet Fever Patients.

In an interesting review of this subject in the *Journal of Medical Research*, Dr. George H. Weaver concludes that streptococci are almost always, if not constantly, present in throat of cases of scarlatina. In early stages they are usually

present in very large numbers, becoming less numerous as the disease progresses.

The streptococci in the throat of scarlatina patients resist dying as long as the other bacteria usually present, and they often outlive all other forms, being alive as long as ninety days after the material is collected.

The streptococci remain alive for a long time in milk.

A small amount of sugar in nutrient media increases their value for the cultivation of streptococci.

Streptococci from scarlatina anginas are not different from streptococci from other sources, so far as cultural and morphologic peculiarities are concerned.

Treatment of Trachoma by X-ray Tube Exposure and by High-frequency Current.

Stephenson and Walsh (Medical Press and Circular No. 7, Progress of Medical Science, 1903) believe a new and brilliant field in the treatment of trachoma has been opened up as a result of their work with the X-ray tube exposure and the high-frequency current.

Of four cases of trachoma treated with the focus tube the eyes appeared to be cured in two, while the other two gave every promise of a favorable result with a continuance of the treatment.

Every case showed a definite improvement from the first exposure. The immediate effect of the focus tube was to render the granular bodies redder and more prominent. This was followed by a stage during which rapid absorption of the granulations took place. From fifteen to seventeen exposures, each lasting ten to fifteen minutes, were followed by a complete cure of the trachomatous affection.

In the use of the focus tube by unskilled or careless persons, great havoc to the delicate structures of the eyes might easily follow.

After twenty-two applications by the high-frequency current a case of trachoma was apparently cured. A twelve-inch spark coil (Cox) was run from the main connection with a D'Arsonval high-frequency apparatus. One end of the solenoid was earthed, while the other was connected with a vulcanite electrode, with which the closed eyelids were gently massaged. A small brush discharge of about half an inch was obtainable from the electrode, and this probably would have acted upon the trachoma equally well without actual contact of the electrode with the lids. So far as can be ascertained this is the first application of the high-frequency current to the eye. By this means, as with the focus tube, more improvement has been effected in trachomatous lids than could have been reasonably expected under months or even years of ordinary escharotics.

Connection between Tonsillitis and Appendicitis.

A casual connection between tonsillitis and appendicitis is assumed by Weber (Journal of American Medical Association, February 7, 1903), in three cases which he describes, although, as the patient recovered without an operation, it was impossible to determine the identity of the germ causing the affection at the two points. Kretz and Schnitzler found the streptococcus in both tonsils and appendix in their cases, and Adrians, the influenza bacillus. Weber agrees with Kretz that the most probable means of infection is the swallowing of germs from the process in the throat, and their lodgment in the appendix. In his cases the appendicitis developed seven days after recovery from the acute tonsillitis in one case, during its course in another, and, in the third, both affections were present when the patient was first seen.

RADIOTHERAPY.

EDITED BY J. D. GIBSON, M. D.

"The X-ray as a Therapeutic Agent." Arthur D. Bevan, M. D. Journal of Am. Med. Assn., January 2, 1904.

The contribution is a very valuable one, treating of the remedial effects of the X-ray in many conditions. In blastomycosis he finds the X-ray especially valuable and urges the use of potass. iodide in connection; as he has relieved cases with the combination after failure with each separately.

In superficial malignant disease he considers it as almost a specific, at least when the disease is not over one cm. in depth. He believes that there is little difference in effect of the X-ray however in either of the three varieties of malignant processes; the difference in results being relative to the depth of the diseased process from surface. He reports some interesting cases of tubercular conditions, especially of tubercular peritonitis favorably influenced by this means and potassium iodide. In his malignant cases he also advised the use of potassium iodide and arsenic and in regional cases when it could be accomplished easily and might be effective, he also advised the ligation of the main arteries supplying the growth to aid in diminishing the nutrition of the growth. When the growth is of considerable size and not very superficial, he thinks an operation should be performed and the case subsequently treated with the X-ray. He speaks only of using low vacuum tubes, and as is well known with such tubes the work done is very superficial.

"Protection against Roentgen Rays, and their Dosage." Medical Record, December 26, 1903.

Levy Dorn, M. D., considers a safe maximum to be that exposure about 20 times the length of exposure necessary for

skiagraphing the adult pelvis. Thus if it takes two minutes to skiagraph the pelvis, the exposure will be $20 \div 4$ of the time — 2 minutes = 10 minutes. A similar calculation is to be carried out if the data should be different, bearing in mind, that the intensity of the X-rays, like that of light, is inversely the square of the distance.

"The X-Rays and Radium in the Treatment of Cancer."
Medical Record-Lancet, January 16, 1904. C. R. C. Lyster, M. D.

"A very large number of cases have been relieved of pain, and that in a certain number retrogression has taken place; of all new growths of which rodent ulcers have been the most satisfactory to treat." Both mild and severe cases have all shown a great tendency to yield to the effect of the rays, the more recent rapidly healing with healthy cicatrix. In the old and far advanced cases they showed a remarkable tendency to heal, but were subject to some recurrences. Of other growths mammary carcinoma seemed to show the best results, especially in the recurrent forms. Sarcomata did not seem so easy to manage as the carcinoma, but he found the most stubborn to yield was the epithelioma.

Report of a Case of Epithelioma of the Upper Lip Treated with the X-rays. By Dr. Brosius, of Gallatin, Mo.



The growth began in December, 1902, and the first exposure was made May 2, 1903, last exposure July 20, 1903, 27 in all. The exposures were made for from 10 to 20 minutes with a low vacuum tube at a distance of 6 to 8 inches. The pain dis-

appeared after the third raying and the growth disappeared in about 50 days. The last 4 exposures were made to make sure of its complete disappearance. The patient remains well to date.

PHOTOTHERAPY.

EDITED BY MARGARET A. CLEAVES, M. D.

Finsen Light Cure.

H. J. Stewart, who has visited the Salford Skin Hospital in Manchester, England, the London General Hospital, and the Light Institute at Copenhagen, found that in all of these institutions the results from the light treatment as per the method of Finsen, were very satisfactory.

Finsen uses a lamp of 20,000 candle power, estimated at twenty times stronger than the ordinary street lamp. The advantage of a lamp of such large candle-power lies in the great number of violet rays produced.

Finsen states that in lupus vulgaris ninety-seven per cent. of cures are effected; even cases in which the whole face is involved are cured.

In eight hundred cases treated, ranging in age from four to seventy-five years, the average duration of the disease was eleven years, and the percentage of cures was ninety-seven.

The light treatment has the advantage over the Roentgen rays that there is no danger of burning and consequent sloughing. In using light a known quantity is being dealt with; with the Roentgen ray it is yet an unknown quantity.

With light there is no pain, a red blister appears where the light is applied, and in five or six days the scab falls off and the ulcer is healed beneath, the skin being free from cicatrix and eventually free of redness.

In the six years the Finsen Medical Light Institute at Copenhagen has been in operation, it has grown from a small shed where only one patient was treated at a time to a magnificent institution, in which are treated three hundred people daily.—Boston Medical and Surgical Journal, January 7, 1904.

Remark: The statement as to the enormous candle power lamps used by Finsen only emphasizes the fact that it is not only light that is needed but a *quantity* of light, and with

lamps of such high amperage, eighty and upwards, as used by Finsen, it is not that the amount of light per unit of area is increased with the increased current, but the size of the crater is increased, giving a larger unit of area than with the smaller current. This is true with given carbons at a given distance apart. With both greater amperage and larger carbons, there is still a further increase in the size of the crater, and consequently in the unit of area, which means still more light and especially more of the valuable short and high frequency waves, so active chemically.

The individual operator is handicapped in his use of light by the enormous expense of operating high amperage lamps because of the great consumption of current. In the Copenhagen Light Institute a beneficent government takes care of the expense. In this way it is possible to carry on the work of the Institute for the greatest good to the greatest number.

There is room for a similar institution in New York City, and given the same equipment and dominating intelligence, equally good results would follow.

For years this has been the writer's hope, a hospital for Light treatment, not only in skin conditions, but in every condition to which light is applicable. In the hospitals where patients are convalescing from acute respiratory conditions, bronchitis, pneumonia, grippe, etc., radiant energy baths would be of the greatest assistance, and especially in the dark, damp, and gloomy days of midwinter and early spring.

In the electric arc is to be found a miniature sun, comparable in every respect to the sun in its activities. Could the medical man become imbued with an appreciation of the nature of the radiant energies of the electric arc, of their physiological action and therapeutic effect, on blood, nerves, respiratory passages, in fact, upon the whole organism, if skillfully directed, it would not be long before hospitals would be adequately equipped with suitable arrangement of arc light mechanisms for therapeutic work.

Denmark is fortunate in possessing a man of Finsen's originality and skill, and he in turn is to be congratulated in having back of him a government so fully alive to the value of his work.

Meanwhile much is being done by individual operators in the use of light, but it must be remembered always that to

secure the best results in long-standing and deep-seated lesions, characteristic of long standing lupus vulgaris, lamps of high amperage are necessary.—THE EDITOR.

THERMOTHERAPY.

EDITED BY CLARENCE EDWARD SKINNER, M. D., LL. D.

Superheated Compressed Air in the Therapeutics of Chronic Catarrhal Otitis Media. By George W. Hopkins, M. D., of Cleveland, Ohio. *Annals of Otology, Rhinology, and Laryngology.*

Hopkins has treated over sixty cases of chronic catarrhal otitis media characterized by ankylosis of the ossicles, by this method and has encountered but four absolute failures. A case cited is so striking in the promise which it holds out to victims of this most obstinate affliction that we quote the report in full as follows:

John L., aged fifty-three, a carpenter, with excellent family and personal history, has never been seriously ill, but has had nasal catarrh for fifteen years and gradually increasing deafness for ten years.

Examination revealed a typical case of hypertrophic rhinitis. The watch tick could be faintly heard with the watch in very close contact with the left ear. The tick could be heard to a distance of three inches from the right ear. The left ear was selected for the test.

Diagnosis: Chronic catarrhal otitis media, with sclerosis and displacement of the tympanum, ankylosis of the ossicles, slight dilation of the Eustachian tube, and some labyrinthine involvement.

The diagnosis was confirmed by two colleagues of reputation as aurists, before treatment was instituted. Regular, systematic treatment, continued for two years before this experiment was made, had scarcely stayed the progress of the disease.

Treatment: The ear was thoroughly cleansed with alcohol for several days before treatment was instituted. The patient was then seated in a comfortable chair, the ear examined and found perfectly clean. Narrow strips of dry gauze were packed into the ear and a large pad of dry gauze placed over the ear. The ear was then covered with the canvas-sleeve hot-air conductor, and a current of air sent into the canal at a temperature which gradually attained 400° F.

The temperature was easily borne, if gradually increased until a high point was reached; the only discomfort attending the treatment arising from a severe headache which followed it, but which was promptly relieved by a dose of codein.

Following the hot air treatment, the Eustachian tube was always inflated with a warm stimulating vapor from a globe nebulizer, vibratory massage with the nebulizer completing the treatment.

The patient was not allowed to leave the office for a half hour after treatment and the ear was tightly packed with warm cotton before he went out.

The nose and pharynx received appropriate treatment with antiseptic washes, etc.

Treatments were continued on alternate days for three months, at the end of which time he could hear the watch tick distinctly at thirty-four inches, and surprised his friends by invariably replying to their whispered references to him.

The right ear was then similarly treated, and in ten weeks an equally good result was secured.

Examination showed that the ears were normal in appearance. The patient was discharged January 6, 1897, and careful tests made at frequent intervals since have shown no tendency to recurrence.

The philosophy of cures by this agency is believed by Dr. Hopkins to be stimulation by the intense heat of the circulation on the posterior side of the manubrium causing absorption of the articular deposits: correction of atrophic processes, and relief of rigidity of the tensor tympania. Even many of the cases characterized by hyperplasia and ordinarily looked upon as hopeless, have been markedly benefited by the treatment.

The apparatus recommended is made by the Terry Heater Co., of Cincinnati, and alcohol, gas or electricity can be utilized for heating it. The air is delivered under compression after being heated and passes through a small-bore nozzle so that its distribution is under control and it can be directed upon any part desired.

Dr. Hopkins describes his technique thus:

The ear selected for treatment is carefully examined and found to be perfectly clean and dry. A light pad of gauze (two thicknesses) is placed over the ear and with an ear speculum the gauze is pressed deeply into the canal. The ear-tip of the heater is then carried well into the canal, leaving only room enough between the tip and the tympanum for the escape of the used air.

The electricity is then turned on, or the gas ignited (as the case may be) and the compressed air is admitted to the cylinder under about five pounds pressure. It is well to give a ten to fifteen-minute seance, increasing the temperature gradually until the limit of toleration is reached. The temperature steadily increases until the heater reaches its generat-

ing limit at that air-pressure, and if the patient tolerates the temperature well it may be further increased by raising the air pressure to seven, eight or even ten pounds, in most cases. One cannot be guided by thermometers in giving these treatments and hence they are not employed on the new heater described. The only guide which can safely be followed is the individual toleration of the patient. But it is well to remember that the more slowly the temperature is raised the higher temperature the patient can endure without discomfort.

Treatments are best given three times a week for from three to twelve months.

Every case must be treated as a whole. He who neglects the appropriate treatment of the naso-pharynx is doomed to disappointment.

Antiseptic washes must be used. All abnormal conditions must be rationally treated. Constitutional measures, when indicated, must not be neglected. Inflation of the Eustachian tube with a warm, stimulating vapor from some good apparatus like the Globe nebulizer is usually imperative.

It is well to practice Eustachian inflation and vibratory massage of the middle ear with medicated vapor from the nebulizer after each hot air treatment, being particular that the vapor is warm. A warm vapor is easily secured by connecting the compressed air heater in service with the nebulizer, sending the compressed air first through the heater and then through the nebulizer.

Careful attention to all details brings most gratifying success in the form of gradually and steadily improved hearing and gradual disappearance of tinnitus.

A single detail neglected may cause absolute failure.

The results which may be expected from the proper application of this treatment are stated to be as follows:

(1) That as an exclusive treatment it is rarely of much value in bad cases.

(2) That when indicated and judiciously employed, in conjunction with other measures of recognized value, it will give results which would be utterly impossible without its aid.

(3) That when employed with care it is absolutely safe unless contraindicated.

(4) That it is of little value in old subjects who have extensive labyrinthine involvement.

(5) That it stimulates absorption of articular deposits, removes atrophy and relieves rigidity of the tensor tympani.

(6) That it acts more favorably on the ossicular chain than on many other articulations, because of their exceptional proximity to the surface.

(7) That arteriosclerosis, serous effusions into the tympanum and perforations of the tympanum are usually contra-

indications and always contraindications to the inexperienced operator.

Hot-air Treatment of Biliary and Renal Lithiasis. Therapie der Gegenwart.

Sachs illustrates an apparatus which he has devised for the application of a stream of superheated air to the kidney or liver region. The air is focused on the spot by a funnel arrangement. The results obtained have surpassed his most sanguine expectations. Jour. A. M. A.

HYDROTHERAPY.

EDITED BY CURRAN POPE, M. D.

Hydrotherapy in Pediatrics.

M. Barts (Cleveland Medical Jour.) writes that he has never derived such satisfaction in treating febrile diseases in children, especially scarlet fever and cholera, as since adopting the tub bath. As to temperature a bath at 90° will give the same results in a child as a bath at 70° in an adult. In ordinary cases five to twelve minutes is sufficient. The soothing effect of the cool bath on the child is a strong argument in its favor. The benefits of the bath are greatly increased by the free application of cold water to the head while the child is in the tub. Hot baths are indicated in chronic exhaustion. Cold sponging or the wet pack sometimes gives equally as good results as the tub bath. He also advocates the internal use of water in the form of lavage and enema for cholera infantum, a normal saline solution being used. The irrigation of the bowel should be used two or three times daily in enterocolitis. Jour. Am. Med. Asso.

The Prolongation of Life.

The advice of Weber for the prolongation of life is summed up in moderation in eating, drinking, and physical indulgence, securing of pure air out of doors and in, keeping of every organ of the body as near as possible in constant working order, daily regular exercise in all weathers, supplemented in many cases by breathing exercises, climbing and walking tours, early going to bed and rising, and restricting of sleep to six or seven hours, daily baths according to individual conditions, cold or warm, or warm followed by cold, regular work and mental occupation, cheerfulness, employment of the great power of the mind in controlling passions and nervous fears,

and strengthening the will in carrying out whatever is useful, and checking the craving for stimulants, alcoholics, and other injurious agencies. Am. Medicine.

MECHANICAL-VIBRATION THERAPY.

EDITED BY FREDERICK H. MORSE, M. D.

Report of Cases Treated by Vibratory Stimulation. By W. P. Rushin, M. D., Albany, Ga.

This system being in its evolutionary stage, I think it would be well for all users of it to give tabulated reports from time to time in order that definite scientific rules might be formed for the guidance of the medical profession in the future.

Case 1. Negro, aged eighteen years, single; occupation, farm hand. Diagnosis: metatarsal abscess on plantar surface of right foot caused by stepping on rusty nail some six months ago. Had violent inflammatory reaction, and was unable to walk for six weeks. Never received any medical attendance during the time. Foot was swollen to nearly twice the normal size; very painful, and could not bear any weight upon it when it came under my care. Evidence of pus located between the second and third metatarsal joints.

Treatment: Incised deeply and washed out the abscess cavity; put in drain, and gave first vibratory stimulation as follows: three-minutes' brush attachment over lymphatics in groin and at bend of knee joint; two minutes over swollen foot and leg. Result, complete relief of pain, while on table. Able to place foot on floor and walk by himself downstairs and to his buggy. Came back in forty-eight hours for second treatment, when there was almost complete cessation of discharge. Walked in from the country two miles to office. Same treatment by vibratory stimulation as given two days before. In addition stimulation with ball attachment two minutes over lumbar and sacral nerves. Saw patient three weeks after, and he says that he has been at work ever since; no discomfort now at all in foot.

Case 2. Male. White, aged twenty years; single; occupation, book-keeper. Diagnosis: Syphilis six weeks; bubo in left groin size of partridge egg. First noticed three days ago. Very painful, preventing sleep during the first two nights almost entirely.

Treatment by vibratory stimulation two minutes, with ball attachment over lumbar and sacral nerves; medium stroke two minutes with brush attachment, light stroke over lymphatics in groin and thigh. Gave same treatment forty-eight hours afterward. Results: patient was relieved of all pain at

first treatment and slept well ever since. Tumor at second treatment was reduced half size. Patient reported three days after last treatment swelling all gone, walks without any limp or discomfort, and declares himself cured of bubo. Of course, constitutional treatment for the syphilis is being continued.

Case 3. Male; white; aged twenty years; occupation, clerk. Previous history, syphilis one year ago. Has received irregular treatment since bubos have formed in groins several times, completely prostrating him for several weeks at a time. The last formed two weeks ago, and is now the size of a hen's egg, involving the chain of glands in left groin. Evidence of pus deep-seated. I decided to test vibratory stimulation in this case, and see if I could get pus absorbed through the lymphatics. Gave vibratory stimulation brush attachment, lightest stroke one minute over swollen glands in groin and thigh; two minutes over lumbar and sacral nerves; ball attachment two minutes over liver and spleen. Brush once every twenty-four to forty-eight hours for a week. At the end of that time there was no diminution of swelling, and I decided to evacuate pus. Patient has been kept free from pain by the treatments for six to eight hours after each one and thus enabled to secure sleep during that length of time, which he was not able to do before without opiates. Made deep incision on sixth day, and let out an ounce or two of bloody pus, showing that the vibration had bruised the walls of the abscess cavity. Washed out abscess cavity with peroxide of hydrogen, and dressed with iodesyl. Gave vibratory stimulation over lumbar and sacral nerves, also over liver and spleen same as before, which gave patient great comfort and relief from pain. In addition I used brush attachment over sympathetics of neck for three and a half minutes to lessen discharge from abscess cavity. Gave four more treatments every other day, and patient was well enough to go on a visit to his parents one hundred miles away, there then being no swelling, discharge, nor pain.

PSYCHO-THERAPY.

EDITED BY LESLIE MEACHAM, M. D.

Some Experiments and Conclusions in Hypnotic Therapeutics. By W. H. Wallace, M. D., Disputanta, Va. Medical News, December 19, 1903. Read before the last session of the Virginia State Medical Society.

The author describes his success in the relief of the insomnia, nervousness, and cough of pulmonary tuberculosis, the pains of locomotor ataxia, asthmatic attacks, delirium tremens, and one probably hystero-neurasthenia, by hypno-

tism and suggestion. A revolving light was generally employed to produce the hypnosis. He believes "that there is a psychical force that produces the phenomena that we call hypnotic sleep," and that "the whole keynote of the phenomena is concentration." This is practically the conclusions of Braid in the second of three widely differing theories he offered upon the subject. He says: "Attention is concentrated on, or by something to such a degree that strain is put on the vasomotor nerves, resulting in a paresis of the whole vasomotor system with a consequent diminished blood pressure. A patient subjected to hypnotic suggestion invariably (in my experience) starts off with a rapid small pulse, a little later it gets harder, slower, and full, and as hypnosis comes on tension diminishes, and if you put one of them into a deep state of somnambulism, the pulse is flaccid and slow. As I said before, blood pressure is diminished; what results? Blood is very easily determined to any portion of the body, because the vessels are wide open, with but one exception. I believe that whereas in physiological sleep the brain is anæmic, in hypnotic sleep it is congested, for, though the body is asleep, the brain is still active, and blood is bound to circulate more freely where there is most activity." He further argues that as the patient gazes upon a revolving mirror and goes to sleep by suggestion, blood pours in upon the brain which alone is active, and that when the attention of the patient is directed by suggestion to an ailing part of the body, there is a rush of blood to the brain center presiding over that part: "The brain cells of that center are crowded together and massaged against one another by the flowing blood, gradually nutrition there is increased." This is supposed to relieve pain. The nutrition of the part is improved from the increased metabolism caused by the activity of the brain center. "Tissue changes take place, the parts are flushed out because of diminished tone of blood-vessels, and the minute vessels are capable of taking up larger extraneous particles than they would at any other time; and they are so taken up and swept out of the tissues and into the general circulation and on, out of the system."

The paper will certainly excite thought, probably disagreement with the author's views, and is an excellent illustration of the extreme and positive opinions that are formed by those with a small experience in suggestion, and with no opportunity to compare views with other experimenters.

SOCIETY MEETINGS.

AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION. THIRTEENTH ANNUAL MEETING.

Held in Atlantic City, N. J., September 22, 23, and 24, 1903.
Daniel R. Brower, M. D., Chicago, President.

(Continued.)

SECOND DAY

The meeting was called to order by the President at 2.20 P. M.

Dr. Margaret A. Cleaves, of New York, read a paper, "Radium, with a Preliminary Note as to its Therapeutic Uses in Cancer."

Dr. Clarence E. Skinner, of New Haven, read a paper, "The Present Status of X-ray Therapy in the Management of Cancer."

Dr. Skinner asked permission to print his paper in full in a European journal.

Dr. Massey moved that this be granted. Seconded.

Dr. Dickson objected on the ground that the by-laws require that such matters be referred to the executive council.

Dr. Massey accepted this, and the matter was so referred.

On motion of Dr. Goodell, seconded by Dr. Massey, the vote on the postponement of the discussion on the X-ray papers was reconsidered.

On motion of Dr. Massey, seconded by Dr. Reyburn, the association proceeded at once to the discussion of the papers on this subject that had been read.

This discussion was participated in by Dr. Snow, Dr. F. B. Bishop, Dr. Abeel, Dr. W. P. Spring, Dr. M. M. Johnson and Dr. Cleaves.

Dr. Herman Grad, of New York, read a paper, "The Roentgen Ray as an Aid in Diagnosis." It was discussed by Dr. Goodell, Dr. Grad making some closing remarks.

Dr. William W. Eaton, of Danvers, Mass., read a paper, "The Use of Galvanic Electricity in the Treatment of Cancer and Kindred Diseases." It was discussed by Drs. Boardman Reed, Snow, Massey, Rockwell, Reyburn, Marks, of Reading, and Grad, and the discussion was closed by Dr. Eaton

Adjournment at 5 P. M.

EVENING SESSION.

The meeting was called to order by the President at 8 P. M. in Executive Session.

The committee appointed to draft resolutions on the death of Dr. Robert Newman then presented resolutions.

The resolutions were unanimously adopted by a rising vote.

Dr. Herdman then said: We all know with what earnestness,

faithfulness, assiduity and success Dr. Newman pursued his labors in connection with the treatment of stricture. I speak of this because it has occasioned so much controversy. Some of us have thought it advisable for this association to appoint a committee with a view to collecting together such material as can be obtained at this time with regard to this and other work done by Dr. Newman, and binding it in a volume to be paid for by subscription among the members. I think we owe this to Dr. Newman. The controversy is not over, and his memory in this respect should be honored. I, therefore, move that a committee of three, of which I should like to see Dr. Dickson the chairman, be appointed for this purpose. Seconded by Dr. Crothers and carried unanimously. The following committee was appointed by the President: Dr. C. R. Dickson, Chairman, Dr. W. J. Herdman and Dr. Emil Heuel.

Dr. S. Mason McCallum, of Philadelphia, was recommended to active membership, and was unanimously elected by a rising vote.

Dr. Charles L. Clark, B. S., M. S. and C. E., of New York, was recommended to associate fellowship, and was unanimously elected in the same manner.

Dr. Lucy Hall-Brown then presented the report of the Committee on Nominations, as follows: For President, Dr. A. D. Rockwell, of New York; First Vice-President, Dr. Willis P. Spring, of Minneapolis; Second Vice-President, Dr. William W. Eaton, of Danvers, Mass.; Treasurer, Dr. Richard J. Nunn, of Savannah; Secretary, Dr. Clarence E. Skinner, of New Haven; Executive Committee: (For one year to fill unexpired term of Dr. Newman) Dr. Francis B. Bishop, of Washington, D. C.; (For three years) Dr. Daniel R. Brower, of Chicago; (For three years) Dr. Maurice F. Pilgrim, of New York.

The committee further stated that, regarding the place of meeting, five communications had been received from St. Louis, inviting the association to meet there between September 12 and 17, 1904; also invitations from Cleveland, Milwaukee, Chattanooga and Niagara Falls.

On motion of Dr. Massey, the Secretary was instructed to cast the ballot of the association for the officers nominated in the report. The ballot was cast, and the officers were declared elected.

Dr. Willis P. Spring moved that the association meet next year at St. Louis. Seconded by Mr. R. G. Brown and carried unanimously.

Dr. W. B. Snow moved that the meeting be held between September 12 and 17.

Dr. C. O. Files moved, as an amendment, that the association meet for four days, viz.: September 13, 14, 15, and 16, 1904. Carried unanimously.

Dr. W. B. Snow moved that Mr. C. L. Clark be added to the Committee on Current Classification and Nomenclature and that the committee be given permission to add to its number. Objection being made that this was contrary to the by-laws, Dr. Snow moved that the by-law bearing on this point be suspended. Seconded by Dr. Reyburn and carried by a vote of 19 to 2.

Dr. C. R. Dickson requested that his vote against this motion be recorded, but at the same time disclaimed any feeling of opposition to the enlargement of the committee.

Dr. Snow then moved that Mr. Clark be added to this committee. Seconded by Dr. Baer and carried unanimously.

The President ruled that the action just taken could prevail only for to-day and to-morrow, and that said action was not binding upon the incoming president.

Mr. William J. Jenks said that the Committee on Current Classification and Nomenclature felt that they had been given rather large latitude. It was found that in order to enter intelligently upon a study of wave currents the nomenclature must be to a certain extent defined. The committee had planned another year's work which would be extremely technical in character.

On motion of Dr. T. D. Crothers, it was unanimously voted that an honorarium of fifty dollars be appropriated to the Secretary for the coming year.

The Auditing Committee reported that the books of the Treasurer had been examined and found correct. On motion, the report was accepted.

Dr. Robert Reyburn moved that abstracts of all papers be sent to the Secretary thirty days before the meeting. Seconded by Dr. A. W. Baer and carried unanimously.

Dr. Nunn suggested that papers of like character be grouped together in order to facilitate discussion.

Dr. A. C. Geyser suggested that the Executive Council be empowered to obtain abstracts and select papers for the next meeting in order to keep the amount of work for that meeting within reasonable bounds.

Dr. Emil Heuel thought that the papers, and not merely the titles, should be in the hands of the Secretary before the meeting.

The Secretary presented only a verbal report. It was to the effect that when all of the dues shall have been paid there would be enough money to run the association economically for the next year.

The Treasurer presented a verbal report, reading from his books.

On motion of Dr. Dickson, seconded by Dr. Cleaves, it was unanimously voted to suspend by-law No. 36 for this meeting in order that the President elect, who was compelled to leave in the morning, might be duly installed. Drs. Massey and Dickson

were appointed a committee to escort the President-elect to the Chair.

The retiring President: I congratulate the association upon the selection of the committee, and the selection of the convention for its presiding officer for the ensuing year. No more deserving member of this association exists anywhere. He is earnest and faithful and a pioneer in our special field. This association honors itself by placing this distinguished member in the Chair.

Dr. A. D. Rockwell, the President elect: Fellow members of the American Electro-Therapeutic Association: I do not find myself in the position of the young lady who received a proposal and exclaimed, "It's so unexpected!" If I have rather held back in accepting this most honorable position it was not because I did not fully appreciate this great honor which you seemed desirous of conferring upon me, but because I am a very lazy man. I have that reputation in my own family, and, therefore, I warn you, gentlemen of the executive council, and the Secretary, that if you don't work harder than you ever did before in your lives you will not have a successful meeting in St. Louis. I feel however, that it would be ungracious for me to refuse such a high honor any more, and, therefore, I did not feel that I could do as Sherman did, and say: "If I am nominated, I will refuse the nomination, and if I am elected I will not serve." So, here I am, gentlemen, and shall do the very best I can, and I regard the honor as greater than if you had elected me years ago. Accept my thanks.

On motion of Dr. A. C. Geyser the association unanimously tendered a vote of thanks to the retiring President for his efficient work.

On motion of Dr. Massey, the thanks of the association were formally tendered to the Secretary, to the members of the local profession, to the signal corps, to the crew of the life-saving station and to the Treasurer.

On motion of Dr. Snow, seconded by Dr. Massey, a vote of thanks was unanimously tendered to the Committee on Current Classification and Nomenclature for their valuable and arduous labors.

The executive session adjourned at 9 P. M., and the remainder of the evening was taken up with a reception given to the association and guests by the local profession.

THIRD DAY.—THURSDAY, SEPTEMBER 24. MORNING SESSION.

The meeting was called to order by the President, Dr. Brower, at 9.30 A. M.

Mr. William J. Jenks, Chairman of the Committee on Current Classification and Nomenclature, presented the report of this committee.

Dr. G. B. Massey then moved the adoption of the following resolutions:

Resolved, That the Committee on Current Classification and Nomenclature be requested to prepare a brief list of electrotherapeutic terms describing currents, which they recommend the association to discontinue, with a list of the proper names placed opposite the terms to be discontinued;

Resolved, That the editor be authorized to correct the terms employed in the papers before publishing the proceedings of the present and future meetings of the association, to correspond with the terminology recognized by the committee. Seconded by Dr. C. R. Dickson.

Dr. W. J. Herdman asked why the term galvanism was dropped, and the term voltaic was allowed to remain.

Mr. Jenks said that while Galvani discovered the physical effect of the current upon the animal organism, it still remained for Volta to build the combination by which the current was obtained. Electrical engineers understood by the "direct current" one that has one direction, while a constant current is one that is always of the same value; whereas a so-called galvanic current might be so modified as to make the current which reaches the patient not at all constant. Hence, the term constant current was regarded by electrical engineers as being a very restricted one, and as not expressing the origin of the current. This explained the necessity for retaining the term, voltaic.

The resolutions were then unanimously adopted.

On motion of Dr. Herdman, the report of the committee was received; the committee was continued and a vote of thanks was extended to it for its valuable work; and the executive council was authorized to supply to the committee such funds as the finances of the association warranted.

On motion, Dr. James C. Gill's paper "Cataphoresis" was ordered read by title.

Dr. Mihran K. Kassabian, of Philadelphia, read a paper, "A Plea for an Accurate and Scientific Method of Roentgen Ray Treatment." It was discussed by Dr. Snow, Dr. Boggs and Mr. Brown, and the discussion was closed by Dr. Kassabian.

Dr. A. W. Baer, of Chicago, read a paper, "Perineuritis." It was discussed by Drs. Snow, Goodell, Nunn, and Pease, and the discussion was closed by Dr. Baer.

Dr. Charles H. Shepard, of Brooklyn, N. Y., read a paper, "The Electro-Thermal Bath." It was discussed by Dr. Herdman.

By request of Dr. M. F. Pilgrim, his paper, "The Value of Mechanical Vibration as an Adjunct to Electro-Therapy" was read by title.

The President: This, Fellows of the American Electro-Therapeutic Association, closes our thirteenth annual convention, and I desire, before a motion to adjourn is made, to again thank the Fellows for the very great honor conferred upon me

by investing me with the powers and responsibilities of this office. I thank you exceedingly for the earnest co-operation and assistance I have received from one and all in its administration. I congratulate you on your earnestness, on your strenuousness, on your devotion to duty. Presiding over this convention has been to me one of great pleasure because of this earnestness and this devotion to duty. I thank you, and I congratulate you on the results of this convention.

Dr. Herdman. Mr. Secretary: I move that we, as members of this association, give a rising vote of thanks for the urbanity and efficiency of our retiring President. Seconded and carried.

On motion, the association adjourned at 12.15 P. M.

MEETING OF THE CLINICAL SOCIETY OF THE NEW YORK SCHOOL OF PHYSICAL THERAPEUTICS.

Stated meeting, December 18, 1903. Leslie Meacham, M. D. in the chair.

Dr. Morris W. Brinkmann: I would like a very harsh criticism. If anyone can prove to me that I am in the wrong, I will be thankful.

Dr. Herman Grad: I was very anxious to hear Dr. Brinkmann's paper and it comes as a great surprise. His arguments upset theories long adhered to. Dr. Brinkmann says that the pneumococcus of Friedlander has nothing to do with pneumonia and believes the germ theory wrong. He claims that twenty years of experience has led him to his conclusions, and that the etiology is with the individual and has nothing to do with infection, the infection being secondary. True we may have a case where all symptoms of pneumonia are present, and yet a single dose of calomel will apparently stop all symptoms, which supports Dr. Brinkmann's theory. There are some points though to be noted. First, we find an increase in proliferation of the cells lining the alveoli of the lungs which the doctor does not account for in his argument. Why is this, if the cells are not directly stimulated by the toxins of the germs? Second, is it possible that the blood pressure alone could give rise to phenomena found in pneumonia? Third, when the doctor spoke of serum-therapy, he said there had been no results from it. As a matter of fact there have been. When the serum fails to act, the failure is due to the fact that it is not the specific serum.

Dr. Sigismund Cohn: Dr. Brinkmann considers pneumonia a secondary disease. He believes the primary cause lies in the abdominal organ, and by a distention of the stomach, liver, etc., a mechanical compression of lung-tissue and a shortening

of space in the thorax takes place. The question is, what do we observe first, the expansion and ascension of the abdominal organs or the process in the lung? However that may be, Dr. Brinkmann's theory would not explain, why we have in one case a lobar, and in the other case, a lobular pneumonia. In regard to the treatment, it is certainly correct to relieve the congestion in the abdominal organs and to influence in this way the blood-pressure and circulation in lungs and heart. The doctor does not recommend milk, because it forms in the stomach a clot of casein, which offers too much resistance to digestion, but as the digestion of milk is effected by rennet, the forming of clots will depend on the condition of the stomach and the composition or dilution of the milk.

Dr. Leslie Meacham: How, when we remove the abdominal pressure, can we remove the exudate that is difficult to cut with a sharp knife?

Dr. G. Betton Massey: The subject is particularly interesting to Philadelphians because, many years ago, we had a fighting doctor, Dr. Corson, in Philadelphia, who advocated bleeding in pneumonia cases, and all the doctors in his neighborhood adopted his plan. At that time nobody got well of pneumonia. Dr. Corson explained, in regard to the failures, that bleeding should be used only in the congestive stage. I am convinced that there must be a microbe in pneumonia. To my mind a typical case of pneumonia demonstrates a typical germ disease.

Dr. Wm. Benham Snow: It seems to me that there are many different sides to the question. There may be a germ present but not active until conditions are favorable. Is it not possible that this upward pressure leaves some parts inactive and furnishes a starting place, as in tuberculosis? We almost always expect to find it over the liver, the lower right lobe of the lung. It seems as though Dr. Brinkmann has opened a discussion in which there is a germ of truth, considering that there is a time when the germ becomes active. The mortality of pneumonia in certain localities, and the absence of mortality in others, is strikingly noticeable. I feel that mortality has a relation to locality. There is a higher rate of mortality in New York City than outside. This subject has come close to us in the taking away of our beloved co-worker, Dr. Pilgrim. In his case the abdominal condition was the critical symptom. There may be a great deal more of this than is thought, and Dr. Brinkmann may be right in his premises.

Dr. Morris W. Brinkmann: I will endeavor to answer the questions. Now, the first questions were those of Dr. Grad. How would you explain the proliferation of catarrhal cells? I wish to state that this paper is on lobar pneumonia, a croupous pneumonia, and there are no cells in the air vesicles of lobar pneumonia except leucocytes, or connective tissue corpuscles.

In regard to the presence of blood I would say as the residual air is removed, the pressure is removed, and the white blood corpuscles can pass through the air vesicle wall. We never have a pulmonary hemorrhage in lobar pneumonia. As to germs, note the following case of marked double lobar pneumonia. A patient breathes forty to fifty times a minute, his pulse is rapid and feeble. Great abdominal distention. There was a large emptying of gases, and of casein, like stones; after enemas of mixt. asafetida had been given. I deny that the germs of pneumonia were a factor in the immediately favorable outcome. Why are the superior lobes involved? Because when the pharyngeal muscles are contracted you get a pressure on the lateral and posterior portion of the lungs, from an esophageal distention. The pharynx is suspended from the basilar process of the occipital bone; hence, when the stomach distends it pulls on the pharynx and compresses the diaphragm upwards. Dr. Cohn spoke of the digestion of milk. I claim that the primary conditions are such that there is no digestion. Starvation will be found more wise than feeding. We may or may not, have a pleuritis. We may have an empyema. In the patient's condition, there is pressure on the intercostal nerves, hence, pain may be present. I have found that the intestines and the stomach were always at fault. Croupous pneumonia is acute and has a rapid course. Catarrhal pneumonia follows the course of the bronchial artery, which corresponds to the esophagus pressure, and when you get distention you cut off the blood supply and have a necrosis. Professor Austin Flint treated equally a number of cases with infusion of quassia with the result that the same number got well and the same number died. In respect to blood letting I would say that it is much older than Dr. Corson. Washington had a tonsillitis, and the result is in history. More died from blood-letting than the sword. In respect to differentiation I would say that in pregnancy the mass is low down, as also in fibroids. Ascites is often complicated with pneumonia.

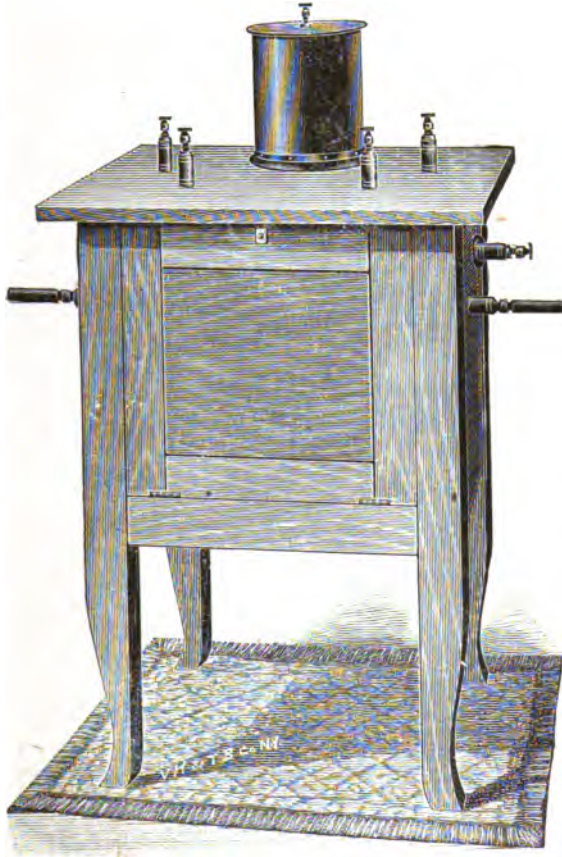
NEW AND IMPROVED APPARATUS.

This department is devoted to publishing, with illustrations, drawings, and descriptions, new apparatus, electrodes, etc., for the benefit of those interested in the progressive improvements in armamentaria.

A NEW HIGH FREQUENCY APPARATUS.

The accompanying cut illustrates the new high frequency apparatus suitable for use on either static machine or coil. It is built to combine in one apparatus the various high frequency currents, which have been found to be of value, and is fitted with such connections that it will deliver the currents of d'Arsonval, Tesla, and Oudin, according to whichever the operator desires to administer.

The terminals are placed in the case, thus effectively muffling the noise of the discharge and also giving abundance of room around them to prevent them from clogging up from continued use. It is finished throughout in lacquered brass and pol-



ished rubber, and, giving as it does a wide range of currents, it is not only an effective apparatus, but a saving of time to the physician who operates it.

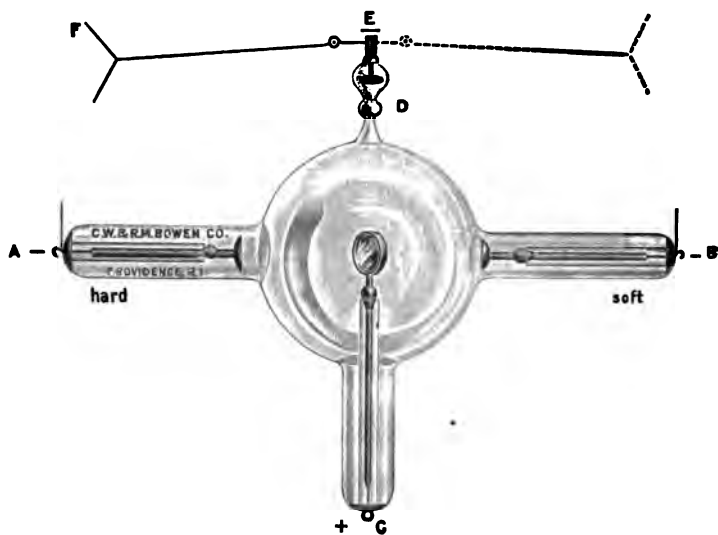
A NEW INVENTION — UNIVERSAL-RECORD-DUPLEX-ROENTGEN-TUBE.*

This newest form of a Roentgen Tube is distinguished for its ability to furnish "hard" rays as well as "soft" ones, without any regulation of the vacuum. In the new tube there are—as shown above—two cathodes, A and B, of different

* Patents applied for in Germany, England, and U. S. A.

form, by which "hard" rays may be produced by using the cathode A, and "soft" rays by using the cathode B. In either case, the anticathode C, serves as anode.

Consequently one side of the tube, A, can be directly used for the penetration of the thicker parts of the body; the other side, B, however, for the thinner objects, and without making any alterations. Further, the bilateral nature of the tube



might prove of inestimable value with regard to therapeutic application of the X-rays.

However, in order to make regulation possible, this new tube is also provided with the well-known Muller patented apparatus for the automatic regulation of the vacuum, which enters into operation by approaching the cathode A or B which is in use with the outer brass lever F, connected with the secondary tube D, until a strong passage of sparks between the cathode and the brass lever is taking place. By this, some gas is produced out of the cathode E of the secondary tube, rendering the main tube softer and, at the same time, stopping the passage of sparks.

Should a tube have become too hard by very long use, so that the vacuum cannot be sufficiently decreased in the way described, the wire of the cathode A or B must be directly connected with the brass lever F of the secondary tube, thus leading the current of the inductor in its full force into the tube, increasing the current by degrees until the wanted degree of softness has been obtained.

Used in this way, this new tube is—just like the former Muller tubes with automatic regulating apparatus—almost everlasting.

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CURRENTS OF HIGH FREQUENCY, APPARATUS AND THERAPEUTIC USES.*

BY F. GOODWIN DU BOSE, SELMA, ALA.,

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The American Medical Association, American Electro-Therapeutic Association, etc.

The most popular of the new modalities of electric currents in use abroad is the "high frequency," this fact is evidenced by going into almost any of the greater hospitals there where one finds an installation of complete apparatus in quarters for its exclusive use. The place of high frequency currents in electro-therapeutics is largely due to the researches of D'Arsonval and Oudin.

There are in the market several modifications of the Tesla H. F. apparatus; the range of applicability of these instruments is limited when compared with the D'Arsonval-Oudin type as manufactured by Dean of London, Gaiffe of Paris, and Scheidel of Chicago, these in the main are similarly constructed and furnish not only every range of strength for local application, but surpass all others in furnishing a systematic charge from 0 to 400 ma. The description of this apparatus given by Mr. Dean in a recent brochure is quoted on account of its clearness and detail.

"The high frequency group under consideration consists of several portions, each forming a link in the chain of development, from the low potential current supplied by the corporation to the high potential current available at the terminals of the Oudin-Dean resonator. The first portion of the group is the switchboard. This item receives the current from the main whose pressure and volume are indicated by the voltmeter and

* Read at the thirteenth annual meeting of the American Electro-Therapeutic Association, at Atlantic City, September, 22, 1903.

ammeter attached to the switchboard. The *raison d'être* of the switchboard is to keep in check and control the flow of current from the electrical supply mains. The current is conducted by the internal wiring to the second item or link in the chain which is the interrupter. It is now taken in its interrupted form to the high potential transformer or coil. In this circuit is interposed a helix of wire called an ohmic resistance which is a further control on the supply mains. The transformer is an induction apparatus whose office is that of transforming a low voltage current into a high voltage current. This is done by surrounding the central winding of coarse wire by a multiplicity of fine wires joined together in a total whose length attains some eighteen or twenty miles. While the latter coil receives its charge from the first one by a phenomenon of induction it must not therefore be supposed that we are in direct metallic connection with the huge machinery of the generating station. Nevertheless the long spark which obtains its origin at the terminals of the fine wire coils is extremely dangerous owing to its high potential of some thousand volts.

"Here then we arrive at the potency stage. The long spark current of high potential is now conducted by copper wires to the high frequency apparatus. This apparatus consists of an equal number of condensers, which in this case are Leyden jars. The high potential current charges the internal layers of the Leyden jars, which become rapidly charged and discharged in a reciprocating manner from one to the other, across the spark gap. It is here that our currents of high potency and high frequency are generated, and now possess the double qualification. The Leyden jar discharges an oscillatory current at a fabulous rate of frequency. We have in this case a double source of these currents giving a double frequency, and since they are of opposite polarity they are alternating in sign. Our current is now an oscillating alternating current of high potential and frequency. The changes of polarity may have reduced the potential but on the other hand the frequency has reached unprecedented figures, said by D'Arsonval to be from two to three million frequencies per second. This point terminates the current of the internal circuit. On the outer sides of the Leyden jars are metallic coatings which are connected together by the helix of wire called the lower solenoid. These

external metallic surfaces are separated from the internal ones by the thick glass walls of the jars. The external ones receive a charge of electricity of high frequency and high potential by the phenomenon of induction, consequently we are not in direct metallic connection with the internal circuit.

These are the currents used in the therapeutic application of this modality. "The upper portion of the helix which is not seen consists of a prolongation of the lower helix, and is called a resonator. It is in this wire that the currents resonate with the lower one, and like other resonators, such as a diapason, respond and amplify the resulting current. Such currents will be seen at the top of the resonator in the shape of long sinuous effluves, blue in character, leaping to and from an object brought near enough to them, and filling the space outside the visible zone with Hertzian waves of electricity, as used in wireless telegraphy." The monopolar current is taken from the top of the resonator over a doubly insulated cord, and the strength of the application is regulated by tapping the lower six or eight threads of the outer helix of the resonator which are left exposed for this purpose.

No insulation of the patient is necessary in the use of this current which furnishes a painless spray with a far greater effluve than that obtained from the static machine.

This current is used in the ignition of vacuum electrodes, for electric massage with the roller, for the glass insulated metal electrode in the treatment of skin diseases, for local sedation and anæsthesia, etc. The bipolar current is taken from the two terminals of the resonator and is used with the couch for the general systemic effect on the patient and also for local cutaneous or superficial anæsthesia.

In transmitting currents of high induction through patients the auto-condensation couch is essential. Its general construction is somewhat like a Morris chair with the addition of a large dispersing electrode consisting of metal sheets under back, seat and foot-rest, connected metallically and insulated from the wood of the chair, and from the patient by a thick rubber cushion. Two metal handles are arranged on the arm of the chair for the patient to grasp, these are connected to one terminal of the high frequency machine and the metal sheet to the other. "When the current is turned on the patient becomes alternately the positive and negative side of the con-

denser; such charges are said to excite the latent electrical currents in the body, giving rise to an excitation called auto-condensation."

The general charge is without sensation to the patient except at first a feeling of warmth and then drowsiness. The inability of a nerve to transmit the sensation of this current is on account of the great frequency of the current. A nerve capable of transmitting sensation at the rate of twenty thousand per second is too slow when in contact with these high potential currents of some million frequencies per second (D'Arsonval). It is a fact, almost incredible to those unacquainted with this apparatus, that as much as 400 milliamperes can be sent through a patient without his experiencing the least discomfort. The effect on the human body is both tonic and eliminative, increasing the output of urea, the exhalation of pulmonary combustions, producing perspiration, a fall of arterial tension, sometimes an acceleration of the pulse and elevation of the temperature. There is an alteration in sensation at the point of entry and exit of the current varying from analgesia to complete local anæsthesia.

The virulence of blue pus is attenuated and the bacillus dies after about a half hour's exposure. It is essentially a current that acts on cell life and the nutritive processes (Hedley).

In this description three effects have been mentioned, viz.: sedation, elimination, and tonic action. This at once suggests a large and varied field of useful application in the treatment of many diseases. In all dyscrasiæ the relief of pain, the elimination of poisons, and the restoration of tone to impaired structures are basic principles of treatment. In the therapeutic application of this current the field is so broad that to specialize in this report would mean the compilation of an index of diseases. It is my purpose to generalize, touching here and there on special effects, and to help on the way for further individual investigation, which has been and is the foundation of the progress and development of therapeutic science.

Two years ago Chisolm Williams of London reported a series of over forty cases of pulmonary tuberculosis treated solely by the auto-condensation couch. These were selected on account of their severity. In the beginning of the treatment there was a transient exaggeration of all the symptoms, rise in temperature after the first few applications, and a loss of weight during the first week, then a gradual improvement in every way, increase of appetite, gain in weight, and finally freedom from cough, return to normal temperature, and ab-

sence of tubercle bacilli from sputum, after the beginning of the treatment these were greatly increased in numbers.

In the year's work I have had with this apparatus I have had no definite results, most of the tubercular cases have gained in weight, some have shown marked improvement, three of the patients gaining fifteen, eighteen, and twenty-one pounds respectively. All my cases however received medical and hygienic treatment in addition to the high frequency currents.

In the treatment of subacute and chronic rheumatism it is most useful. Williams spoke enthusiastically last summer of his results in these conditions and exhibited to me a case who had been a helpless cripple for a year before beginning treatment; in six months after he was playing tennis, having practically recovered. For the reduction of joint enlargements and for the relief of the pain, as well as its tonic and eliminative effect on the system it is as yet the best treatment now used in rheumatism. I have used the couch condensation in the treatment of a case of glycosuria, with diabetic symptoms, which did not disappear after the regulation of diet. The pains in the legs, itching of the skin, and polyuria were relieved and the sugar disappeared from the urine. In three months the patient was discharged free from any evidence of her former disorder.

As a tonic in depraved conditions, neurasthenia, dyspepsia, anæmia, chlorosis, neuritis, sciatica, and headaches, it acts more rapidly than drugs and should be the basis of treatment, supplemented by such hygienic and dietetic measures as indicated.

Its local application will more frequently be required, and it is no small thing in this profession to relieve minor ailments and he who passes them lightly by will lose the opportunity to treat the major conditions. One effect should especially interest electro-therapeutists, its ability to immediately relieve pelvic pain, not dependent on gross pathologic lesions. It is after intrauterine use of the constant current for the aching in back, pelvis, and down the thigh, so often consequent thereto, that I have always obtained immediate relief and a decided therapeutic aid, by the use of the vaginal vacuum tube electrode, monopolar, if the back is the seat of most pain then bipolar one electrode over abdomen and one over back. Post operative pelvic pain, so often the disappointment of patient and surgeon, ovarian neuralgia, menorrhagia, and congestive pelvic conditions are all amenable to its influence. Eczema, furuncles, acne, skin eruptions generally, especially chronic dermatitis, pruritus, and varicose ulcers all come under its power for relief and cure. In minor surgery to produce local anæsthesia, it will, in most instances, replace cocaine or infiltration methods. The use of the knife can be avoided in the treatment of most cases of hemorrhoids if the olive rectal electrode is used alternate days with the resonator current. In varicose ulcers of the leg I have used the high frequency

side by side with static brush discharge applications with results invariably in favor of the former. One case of neuritis of the right arm was cured by the effluve locally and the cough generally in two weeks' daily treatment. This case had been treated for three months by drugs, liniments, immobilization of the arm, dieting, etc., without relief. It is my conviction, after a year's experience with the daily use of this apparatus, that it is the most useful part of the electro-therapeutic armamentarium we have at present. With the Oudin type of high frequency machine we can duplicate practically every static effect, do X-ray work by using the coil, and go into a domain of usefulness heretofore unknown. Some difficulties are encountered in adapting the foreign makes of this apparatus to the American commercial currents, as I soon found out after purchasing mine, and I think I had the first of the type under consideration ever brought to the United States. It was after much trouble and inquiry, and with the assistance of Scheidel, of Chicago, that I succeeded in getting my entire outfit rearranged and adapted to use with the alternating current. He is making a thoroughly modern and improved outfit at a cost in easy reach of everyone. The resonator current can be varied from the weakest to the strongest by means of a sliding post. All static electrodes can be used for their different effects, the massage roller and multiple point electrode being especially useful. The couch current can be regulated from 0 to 400 milliamperes.

Discussion.

Dr. A. D. Rockwell said that in the production of sound there were thirty-six thousand vibrations per minute, but Hertz had shown that in these high frequency currents there were hundreds of millions of vibrations per second. There was an entire absence of sensory or motor effect from such currents, as he understood it. He would disagree with the author concerning amperage or magnitude of these currents. The reader said that four hundred milliamperes could be obtained, but he did not believe this. He was of the opinion that in the step-up process magnitude was lost, high frequency being obtained at the expense of magnitude. The light could be made to glow by an alternating current which would burn, or at least be disagreeable, and he was more than disposed to believe that instead of four hundred milliamperes not more than from three to five milliamperes passed. Abroad, they meant by high frequency current the D'Arsonval current. The relative therapeutic efficiency of the two currents could be determined without much difficulty. He had had some experience with these currents. As stated in the paper, they produced a positive effect upon the general nutrition, but, he thought, there was no effect on general nutrition from the hypostatic current.

The latter was useful almost exclusively in superficial diseases of the skin.

Dr. F. B. Bishop said it was his great pleasure a few weeks ago, while in New York City, to see, through the kindness of Dr. Henry Waite, in Dr. Piffard's office, a 16-candle power lamp lighted through the D'Arsonval coil. The lamp was lighted by a current from a 14-plate static machine. It brought the lamp to perfect incandescence—white heat. Heretofore it had been very difficult to use the hypostatic coil in damp weather, but by obtaining a discharge from the discharging rods of the machine the current could be obtained at any time, and by a spark gap of one inch and a half or two inches. A very decided spark could be obtained which would penetrate any tissue—indeed, it could be passed through the soles of one's boots and into the feet. The speaker said he had used this spark in the treatment of enlarged joints in rheumatoid arthritis, and in various forms of neuritis, with very good effect. To his mind, the high frequency current was the coming current, and he believed it was going to be more generally used than any other current. Dr. Piffard had done a great service to the profession by manufacturing this coil. It was not only useful in the treatment of skin diseases, but it had a good effect upon congestive conditions in the cavities and canals of the body.

Dr. A. C. Bayliss said that last summer he had spent some time with Dr. Chisholm Williams, who was very enthusiastic in the use of the high frequency current, so much so that he had reported several cases of pulmonary tuberculosis that he had treated with great improvement. The greatest benefit, the speaker said, that he could observe from this high frequency current was that it took the place of the static machine. More volume was obtained than with the static machine, but, he thought, cases were of about the same class as those in which the static machine was employed. Dr. Lewis Jones had a high frequency apparatus, but was not so enthusiastic regarding its capabilities. Dr. Williams said that his first rheostat was made out of the wire of a spring mattress.

Dr. A. W. Baer questioned the amount of amperage. He said that the average coil would take four or five, and occasionally, ten amperes. He could not see how it was possible to run ten amperes through a coil into a high frequency apparatus, and get an increase of amperage. Another statement was that there were twenty miles of wire in the apparatus; judging from the size of the apparatus this could not be so.

Dr. G. Betton Massey said it was probably true that four hundred milliamperes could be passed through the hand and light a lamp, because this had been shown to the members in a laboratory demonstration given at Lynn at a previous meeting.

A PLEA FOR ELECTRO-THERAPEUTICS PROPER.*

BY W. J. HERDMAN, M. D., LL. D., ANN ARBOR, MICH.

(Continued from page 139.)

I have ventured these statements of well-known facts concerning the induced current modalities in order to call to mind that they are adapted, by suitable selection, for producing an exciting or stimulating effect by which they become *tonic, constructive, eliminant*, or a soothing and quieting effect, whereby they are *sedative, antispasmodic, analgesic, hypnotic*; and these effects, by the proper use of such currents, can be brought about on both nerve and muscle tissue as the exigencies of the case may require, and always they exert also a certain amount of stimulating influence on the nutritive activities of the protoplasm of all other living cells.

The High-tension, High-frequency Currents of Tesla, Elihu Thomson, d'Arsonval, and other competent physicists, are found from numerous tests now on record made by reliable observers, to have effects upon the living animal organism of much therapeutic value. These currents are alternating in polarity like the induced currents already described. The frequency of alternations that have been reached by one or another form of apparatus and employed in physiological experiments and therapeutics have ranged from 10,000 to 1,500,000 per second. The electromotive force has varied from 60,000 to 300,000 volts. The current has been estimated to range from one-third of an ampere to five amperes. When we consider these characteristics, the physiological effects which have been observed more or less by all who have experimented with currents of this character, are truly remarkable.

The results are that currents of this nature:

Have no effect on motor nerves.

Have no effect on sensory nerves, except, perhaps, a gentle feeling of warmth at the place where contact is made with the surface of the cuticle.

Have no contractile effect on muscular tissue. In some instances a very slight degree of tension or heaviness is noticeable in the muscles in the immediate vicinity of the electrode.

* Read at the thirteenth annual meeting of the American Electro-Therapeutic Association, at Atlantic City, September 23, 1903.

They cause at first vaso-motor dilatation with lowering of blood-pressure, but this is soon followed by energetic contraction of the vessels which remain contracted and the blood pressure rises.

They increase tissue metabolism, as is shown by the larger consumption of oxygen and the greater elimination of carbon dioxide and urea by the person experimented on.

They increase the production of heat.

They retard the growth of pathogenic bacteria and decrease the virulence of the toxins which these bacteria produce (d'Arsonval and Charrin).

From these results it will be seen that the high-tension high-frequency currents impart an extraordinary activity to the nutritive processes of animal tissues, without disturbing to any extent the phenomena of conscious life.

In the majority of cases where these currents have been employed for therapeutic purposes they have exercised a powerful and generally reparative action on diseases caused by or attended with feeble nutrition, by accelerating the organic changes and by increasing the activity of enfeebled or perverted katabolism and elimination. Excretion is hastened and diuresis becomes generally more satisfactory. Neurasthenia and many other functional and nutritional nervous disorders are benefited by this method of treatment. Especially when the nervous condition is the result of over mental work, accompanied by the defective elimination characteristic of rheumatism or gout, the use of the high-tension high-frequency currents results in return of sleep, return of good feeling, capacity to work, increase of appetite, and a renewal of force and vital energy.

The Static Charge and Currents.—Static or franklinic electricity as obtained from the static or influence machine has, under certain of the conditions of generation, the qualities of high-tension, high-frequency currents and the same effects that are mentioned under that head can be obtained from it. The static machine is, however, as you well know, adapted for a much wider range of therapeutic applications, and in skillful hands can be made to cover a large share of the effective service accomplished by all other of the electric modalities, with the exception of those of electrolysis and phoresis, in which it must yield the palm to the constant current.

Magnetic Fields and Alternating Magnetic Stress.—For a

long time it was thought that magnetism was in no way correlated to animal physiology, since a variety of carefully devised experiments by competent observers gave no tangible results. But this was owing chiefly, I believe, to the fact that these experiments were conducted with unvarying magnetic stresses, and were not continued over a sufficiently long period. In a series of experiments with alternating magnetic stresses, which have now been carried on in the Electro-Therapeutic laboratory of the University of Michigan, under my direction, for a number of years, it has been proved conclusively that magnetism employed in this manner has a marked influence on quickening metabolism, in promoting growth, and in increasing the excretion of urea. These results have been obtained from a prolonged series of tests on both man and on young animals by keeping them in a space pervaded by rapidly alternating magnetic stress for several hours each day.

These tests on the physiological action of alternating magnetic fields have been supplemented by a few attempts to determine the effect of a rapidly alternating magnetic field on the treatment of chronic muscular and articular rheumatism and sciatica, and states of fatigue. The benefit which these patients seem to have obtained from the treatment is, to say the least, quite marked, and the method gives promise of much therapeutic usefulness. One strong recommendation in its favor is that it can be readily applied to nervous, excitable, and to bed-ridden patients, and to children, without exciting the least opposition or discomfort. The patient need not be aware, from any sensations experienced, that he is undergoing treatment.

Will you now kindly permit me to relate one or two personal experiences with the first of these modalities only—the constant current—of the action of which we hear too little in these latter days from those who are best prepared to speak. I furnish these only as samples of the every-day experience of the “sound to the core” electro-therapist, the one who knows and believes in the agent he employs, and knows its capacity to do some things well, better, in fact, than any other tool he can lay his hands on in the vast store-house of medical or surgical therapeutic armamentarium.

Electrolysis—that action of the constant current, regarding which there is no room for doubt, which has its own way of

enforcing belief in its existence whenever a "live wire" is meddled with and its current density is greater than the forces of the living tissue in contact with it can withstand. This property of the constant electric current is alone worth more to the medical profession as an aid to the work they have to do for humanity than half the drugs now listed in the pharmacopœia, or of the instruments which make up the surgeon's kit.

But its duplex polarity action must be well understood, and skill in manipulating it must be of the highest order of merit, for it does not yield its best results to the ignorant, the inexperienced, or the bungler.

Without electrolysis what can the physician or the surgeon do when a patient applies to him with an osteo-sarcoma of the superior maxillary bone, involving the whole of the alveolar arch on the right side, extending upward so as to encroach upon the antrum and inward to the median line of the jaw so as to displace the tongue to the left side and back part of the oral cavity. The bone is rarefied and yielding to pressure, the tumor nodular in surface and quite vascular, having reached this size in four months' time.

This is a condition which even conservative surgery would say would require the excision of the entire right supra-maxilla. A dangerous and bloody operation. An operation in which the use of an anæsthetic is hazardous; a procedure entailing weeks of suffering during the healing process with subsequent permanent impairment of speech, deglutition, and facial symmetry. But only three months ago a patient in this condition came to me, and my former experience with similar cases justified me in suggesting to him that he submit to the electrolytic method of treatment. He did so, and after a period of six weeks, during which time he received six applications of electrolysis, one each week, which consisted of thrusting gold-plated needles at first into the margins of the growth to the depth of an inch in some places, and later into the center, making these needles the anode of a constant current which measured 15 ma., and allowing the action to continue at each insertion for five minutes' time. Subsidence of the growth was noticeable after the second treatment, and after the sixth it had receded to the normal level of the jaw. A two per cent. hydrochlorate of cocain solution was applied to the mucous membrane surface before the needles were introduced. The pain was never unbearable, there was no blood shed, and the only time lost by the patient from his business throughout the entire period given to treatment was the hour each week spent in my office.

The surface of the jaw is now, to all appearances, normal, except for the little pits here and there, as shown in the photograph (Fig. 1), where certain of the needles entered.

Many of you are not confined in your practice to electro-

therapeutic methods, but are quite as familiar with modern surgical procedures and skilled in using them. Tell us if you know of any more conservative or humane, any more efficient way, by which this happy result could have been attained? And when I assure you, and have the evidence to sustain the statement, that this is only one instance among the many of



Fig. 1.—A Case of Osteo-Sarcoma.

like nature which have occurred in my practice, and that not a very extensive one, in the past few years, it will only serve to show you what opportunities are being lost each day for doing better than is now done the work that surgery is attempting in cases similar to this.

I cannot attempt to explain all the details of the action of anodal electrolysis by which results like this are brought about. Certain things we do know positively as to its action upon living animal tissues, and we can make certain quite positive statements based upon this knowledge. We know that by reason of the ions caused to accumulate about a needle point by a constant current of this strength, when it is thrust into

a very vascular normal or abnormal tissue, that a styptic or coagulative action takes place, and that the circulation of blood and lymph is impeded and to that extent the growth is checked. We also know that certain of the living cells in the immediate vicinity of the needles, where the current density is greatest, are disintegrated and destroyed, and if living parasites or bacteria are in any measure responsible for the abnormal growth they likewise meet a similar fate. Again, it is more than probable, reasoning from analogy, that outside the field of the disintegrated tissue the stimulating action of the electric current on the normal cells' activity, quickens their vital energy and enables them to offer greater resistance to the influences which attended the growth of the neoplasm. Certainly we must admit that the malignant growth is averted, its tissue destroyed and absorbed, and the usual relationship of the tissues normal to the part is restored, and that all this follows as the direct result of a few applications, for a definite time, of a constant electric current of a definite density.

If I have, my much respected fellow-members and associates, by this hasty and by no means comprehensive glance at the foundations of that structure which we have undertaken to build, served to remind you of the solid ground on which it stands and of the goodly material we have ready at hand with which to make sure the substantial and enduring quality of the edifice we erect; and if I have thereby encouraged some to work on patiently with the abundant material electricity has to offer *in itself*, turning neither to the right hand nor to the left after some new thing, but continuing steadfast, until his work is well done, and his results challenge attention and impel belief, I will deem my time well spent and the subject of my paper not illy chosen or untimely.

Discussion.

Dr. M. A. Cleaves said she felt a personal debt to Dr. Herdman for this encouraging and valuable paper. The tendency to-day certainly is to neglect the modalities which are fundamental, and which are capable of doing so much good work. She said this despite the fact that she intended to present at this meeting a paper dealing with the use of one of the newer forms of electro-therapy.

Dr. C. R. Dickson said no one could find fault with the reader of the paper, but he wished to take issue with the opening remarks. When Dr. Herdman said that he feared the association was in danger of selling its birthright for a mess of pottage he felt deeply grieved. One way this could be prevented was by Dr. Herdman attending the meetings rather more regularly and giving us the benefit of his knowledge and advice. The charter members declared that the object of the association was to be the cultivation and promotion of

knowledge of whatever related to the application of electricity to medicine and surgery—not simply knowledge regarding the constant current. Could Dr. Herdman or anyone else present tell him what electricity was? How long and how far did electricity extend? If Dr. Herdman had been present last evening he would have heard our revered friend, Dr. Nunn, talking about vibration of the ether; just fancy, *vibration* of the ether. Why should we object, then, to vibration in something solid—in the flesh? The speaker thought it was quite within the province of the association to study these newer modalities; certainly the Constitution showed that this was the intention of the devoted electro-therapeutists who founded this association. It was better to advance, he thought, along the lines of electricity, whether vibrations of the ether or of something more solid. With the rest of Dr. Herdman's paper he agreed most heartily.

Dr. Massey thought the remarks of the last speaker were somewhat hypercritical, although they contained a truth. They contained a truth which was illustrated in one of our medico-religious sects, *i. e.*, that nothing is accurately defined. There was a difference between one and two o'clock in the day; nevertheless, the time was brief for the work in hand to-day. Although this was the Electro-Therapeutic Association, it was fresh and ready for anything new and true in any direction; yet there were certain duties of a narrower character thrust upon the members, and he, for one, was very glad that these duties had been so eloquently presented in Dr. Herdman's paper.

Dr. Marcus M. Johnson said that his professional work was in surgery, but he found that it was a great advantage to make use in his practice of all the valuable properties of electricity. the case of osteo-sarcoma reported by Dr. Herdman proved the remarkable work which he had done. In the surgical operation usually done for the relief of this condition one certainly opened up many chances for infection. He had seen the growth reappear in the tissues after all such extensive and radical operative procedures. Of course, the case reported was not done with, and it could not be said whether or not the disease would recur; nevertheless Dr. Herdman had not subjected his patient to torment nor jeopardized his life in the attempt to eradicate the disease. While surgery was doing a great work in many lines in the way of restoring health and saving life, yet in certain lines it reached its limitations, and this was one of them. He, therefore, welcomed all the aid that could be derived from electricity.

Dr. F. B. Bishop said that the last time the association met in Buffalo the tendency was all in the direction of the static current, and he was about the only one present at the meeting to represent the continuous current. He was glad, therefore,

to see that Dr. Herdman had spoken so forcefully in favor of the old constant current. With regard to static electricity and the currents of high frequency he thought there was a slight difference between the static current and the high frequency current especially in the use of the spark. The spark of the high frequency current was very much more penetrating and was less painful. Whether it produced the same effect he was unable to say.

Dr. Snow said he rose partially in defense of a principle involved, and partially to thank Dr. Herdman for his paper. He did not wish it to be thought that in the official journal there was any disposition to give electro-therapeutics a second place. Dr. Herdman had well explained the different advantages of the various modalities and methods. There were very few indications in the treatment of disease that could not be met in one way or another by some one of these modalities. Nevertheless we were first physicians rather than electro-therapeutists, and it was our earnest wish to do the best possible for our patients with the knowledge at hand. We should, therefore, be able not only to use electricity but any other physical agent. All forms of vibration, such as heat and light, and others closely allied to electricity, should be employed. Personally, he would not place electricity in any second place; nevertheless it was his earnest wish to lay the truth before the readers of the journal, and he hoped to be able to give more space for the opinions of the readers. He hoped those who were walled out by prejudice would in time find through familiar channels the value of electricity.

Dr. F. B. Bishop explained that in making his remarks he had not intended to cast any reflection upon any periodicals, on vibratory therapeutics or anything else; he did think, however, that we were tending to deviate too far from the use of the direct and the induced current.

Dr. Herdman said he had received a good deal of enlightenment from this discussion, and was particularly pleased to know that some of our English brethren were capable of appreciating one of our jokes. But, seriously, the center of the solar system was the sun. We were organized for a different purpose, we were not organized for any of this borderline work. If the sun became displaced, the solar system would become disorganized and eccentric. Did we wish to have that character among our brethren in the profession? The practical question that we were asked was: "Why are you wandering into these by-paths and after these will-o'-wisps; why go out of your own field and attempt to do the work for which other associations have been organized?" Out of thirty-four papers, thirteen were on outside subjects—a rather large proportion, in his opinion, when the special duty of the association was to uphold and give dignity to electro-therapeutics.

A NEW SYSTEM OF HIGH FREQUENCY THERAPEUTICS.

BY FREDERIC F. STRONG, M. D.

(Continued from page 163.)

It was my intention to devote this paper to a detailed consideration of the physical nature of high frequency currents and the various methods by which they may be produced. But the rapid increase in the number of physicians who are using the perfected form of the apparatus and who are anxious for instruction in the technique and working details thereof, has led to the change of the order of presentation of certain divisions of the subject, and I shall, therefore, pass at once to the discussion of practical working details.

The machine known as the Strong-Ovington Static Induction and High Frequency Apparatus is the perfected form of generator that I have used for the past seven years in the successful treatment of a wide range of diseased conditions. The original apparatus was completed during the spring of 1896, and was designed solely for the generation of the X-ray. It was one of the first powerful X-ray machines that was constructed in this city, and while cumbrous, inefficient, and crude, it nevertheless gave a current of great voltage and frequency, differing in no essential point from that which is obtained from the perfected apparatus. The improvements that have been made have been directed to the perfection of mechanical details, efficiency of action, etc.

The original machine consisted of a large step-up transformer, containing eight pounds of number 36, silk-covered wire in the secondary coil, the primary consisting of layers of number 12 wire, wound around an iron core, 3x12 inches. The secondary was wound in thin disks or sections, like the majority of induction coils, and the completed apparatus (immersed in oil) gave a good seven and one-half inch spark when used as a Ruhmkorf coil. This transformer was designed for use on the 104 volt alternating current, the secondary being connected to the two sides of a condenser formed of sixteen pairs of glass plates, 5x7, coated on one side with tinfoil, and built up in the usual manner; this was also immersed in oil. My original Tesla coil was made from a three-inch pasteboard mailing tube, eight inches long, evenly wound

with a singing layer of smooth linen twine, the depression between the adjacent convolutions forming a spiral groove, in which was wound a layer of number 40, silk-covered, magnet wire. Ten turns of heavy, rubber-covered number 10 wire were wound around a three and one-half inch pasteboard tube, and slipped over the above secondary coil. The Tesla transformer thus completed was immersed in oil, and the ends of the number 40 wire of the secondary coil were brought out through heavy glass tubes, and connected with terminals with sliding rods, similar to those on a small static machine. The ends of the large wire, which formed the primary, were brought out in a similar manner, and connected to the two sides of the condenser. A small spark-gap (consisting of two brass balls about one-sixteenth inch apart) being included in the circuit in series with the primary coil. In actual use it was found necessary to employ some device to cool the air which formed this gap, as the heavy discharge of the condenser caused the balls to become red-hot, thereby destroying the oscillations and forming an arc. After trying various devices, an apparatus was adopted, consisting of a metal wheel, bearing a number of wings, which were revolved in front of a brass ball, the discharges taking place between the latter and the moving metal wings. This device has, in the writer's opinion, never been excelled for this particular purpose, and is employed, in a greatly improved form, in the modern perfected machine. This apparatus was designed by M. E. Cate, of the Knott Apparatus Company, who were the first manufacturers to bring out a practical high frequency apparatus for X-ray work. Their apparatus possessed the same serious defect as mine—the necessity of using a heavy and cumbrous oil tank for the insulation of the working parts.

As the principles involved in the original machine are identical with those upon which the perfected apparatus is based, one explanation can be made to serve for both. The apparatus (in common with all high frequency generators in which the Tesla principle is employed) is designed to operate on an alternating current. The usual form of alternating current that is used for incandescent lighting, is 104 volt, and 60 cycles per second (a cycle is a complete wave, and consists of two alternations). In my perfected apparatus a small rotary converter is employed when it is desired to operate the machine on a direct or continuous current. When the physical nature of high frequency currents, and the various methods that are employed in their production, are considered, the writer will explain why it is that high frequency currents generated by the Tesla principle, which starts with a low voltage alternating

current, is most perfectly adapted for use in an apparatus for therapeutic purposes. For the present, it will suffice to say that the Tesla method is the only one by which a smooth, continuous oscillation can be obtained.

It is somewhat amusing to read in one of the European textbooks, that: "High frequency therapeutics are unknown in America, except in a few instances where an attempt has been made to obtain these currents by the crude and inefficient Tesla method, which has been thoroughly tested and discarded as impractical by the European investigators." As a matter of fact, the current from the perfected apparatus bears the same relation to the discharges produced from the European solenoids, resonators (all of which are excited by the secondary current of a Ruhmkorf coil), as the rich vibration of the organ pipe bears to the weak staccato produced by intermittently striking the same note on a piano.

In the perfected, as well as in the original form of the apparatus, there are three essential factors, two of which are used to raise the voltage, while the third increases the frequency of the original alternating current.

The 104 volt current, alternating 120 times per second, passes into the primary of the step-up transformer (the electro-magnetic inductor) and induces in the secondary a current of similar frequency, but of about 15,000 volts. This flows into the condenser, which is like an elastic reservoir, and which suddenly discharges when the pressure becomes sufficient to break down the barrier of air at the spark gap. By carefully tuning the primary of the Tesla coil, by adjusting the number of turns to the capacity of the condenser, oscillatory discharges will be set up every time the pressure in the condenser breaks down the air gap. There may be thousands, or even millions, of these oscillations for every initial discharge of the condenser. There is, therefore, a high frequency current passing through the primary of the Tesla coil and across the spark gap, but the voltage still remains 15,000. In Europe a current similar to that just mentioned is produced in the D'Arsonval solenoid, and is used principally to produce increased tissue combustion, and to burn up uric acid and other waste products. The more important effects of the high frequency currents on the nerves and vasomotor system are not obtained without further increase in the voltage of the current. In the Tesla system this increase in voltage is brought about by the inductive action of the primary on the secondary coil of the Tesla transformer. This is an illustration of electrostatic induction, no iron being used in the high tension coil. A potential of between one and two million volts is obtained by the final transformation in the Tesla coil of the perfected apparatus; this is considerably higher than was obtained from the earlier forms of my machine.

If the edge of a stiff card be pressed upon the rim of a slowly revolving toothed wheel, a series of sharp clicks will be produced. If the speed of rotation be gradually increased, a point is reached at which the individual clicks or impulses are no longer perceptible to the ear, being replaced by a sustained vibration or musical tone. This critical point varies somewhat with different people. In like manner, by increasing the rate of vibration, the pitch will be raised to such a high note that the range of sensibility of the aural apparatus is exceeded and the sound is no longer perceived. If we connect the muscles of each leg of an anæsthetized animal to an alternating current dynamo of suitable power, we will observe a sharp contraction at every alternation as long as the latter are not too rapid. As the frequency increases, however, the intensity of the contractions decreases until a point is finally reached at which the muscles cease to respond, although the voltage and alternations may be greater than at lower frequencies. From a physiological or therapeutic standpoint, we may speak of an alternating current as high frequency when the number of impulses is above the point at which muscular contractions cease. The statement that the higher the frequency, the more superficial is the action on the body, is entirely erroneous. Surface action is a peculiarity of the static charge alone. The more kinetic the nature of the current, the more deeply does it penetrate the tissues. This subject will be more fully considered in the next paper.

In developing the system of technique which is used in connection with my apparatus, a number of special instruments and electrodes have been designed by the writer. Although generally known in this city, the fact that the writer was the originator of the vacuum electrode, and the various methods of treatment through glass, is not generally recognized. The first vacuum electrodes were demonstrated before one of the local medical societies in 1897, and I have used such electrodes constantly ever since.

The technique which I have developed for the therapeutic use of high frequency currents, as produced by my apparatus, comprises the use of a number of distinct methods, which may be grouped under the following heads:

I. Methods involving the use of glass electrodes (treating through glass).

(a) Vacuum electrodes.

*(b) Hollow glass electrodes, containing solutions of salt, carbon powder, metal rods, etc.

(c) Sparks from metal points upon plate glass held in con-

* In a subsequent article will be described and illustrated a large number of different electrodes which have been devised by the writer for use in special cases or conditions. Similar electrodes have been invented and described by foreign workers within the last year or two.

tact with the body. (Of special value in nervous dyspepsia, constipation, etc.)

2. Methods involving the use of the "Tesla brush discharge," "high frequency spray" (the "effluve" of the foreign investigators).

(a) Discharge from single metal point.

(b) Discharge from metal brush or multiple point.

3. High frequency bath, by the use of the "condenser couch" of D'Arsonval, or by use of insulating platform and "canopy electrode."

4. "Wave current" or "vibratory massage." Bipolar treatment with metallic electrodes in contact with the patient, a variable air gap in series with the latter.

5. Sparks, or arcs, between the surface of the body and a metal point connected with one terminal of the machine. (Used only for counter-irritant and cautery work.)

To facilitate the employment of these methods of treatment a set of terminals have been employed for the past five years which have come to be recognized as a distinguishing feature of the apparatus. The terminals of the high-tension coil are brought up through rubber pillars which support sliding rods, one of which (at the right) ends in a small brass ball, while the other, at the left, terminates in a brass disk (a). Midway between these is a third pillar called the "Dummy" having a brass disk fixed upon its right side, and a ball upon the left. By closing the gap between the disks the discharge may be studied as an arc between the stationary and sliding ball. With these balls widely separated the arc breaks up into a series of spark-like effects resembling the discharge of a static machine. When the gap is from two to four inches in length, however, a perfect arc or singing flame is produced which gives out appreciable heat. This can be demonstrated by lighting a stick of wood in the discharge, or by holding the hand a few inches above it. By closing the gap between the balls and drawing the disks apart, a different form of discharge is produced,—the beautiful and spectacular "Tesla brush discharge," consisting of a fine rain of purple hair-like lines completely filling the gap between the disks and radiating on all sides.

As this article has already been unduly extended, the details of the various methods of using the Tesla currents for therapeutic purposes will be described in full in the next paper of this series.

(To be continued.)

METHODS USED IN RADIOGRAPHY.*

BY RUSSELL H. BOGGS, M. D., PITTSBURG, PA.

Since the discovery of X-ray there has been a steady and rapid improvement both in apparatus and technique used in radiography. But still there is no standard method or apparatus adopted by any two radiographers. However, many are doing about the same grade of work, and are having nearly the same results.

There is much more careful and accurate work in radiography than most physicians realize. A large majority of physicians seem to think all that is necessary is to buy an apparatus, a few tubes and other accessories, but anyone who has had experience knows how wide they are from the mark. The manufactures being anxious to sell apparatus are responsible to a great extent for this, and even most of them will admit that they are unable to produce good radiographs.

Radiography is a specialty that can only be successfully accomplished by making a careful study of each and every part of the apparatus, and the physics which govern them. Then only will the operator be able to produce the same results from day to day. However, many physicians are attempting to make radiographs and to treat cases who do not understand vacuum tubes, that is, they do not understand the different degrees of vacuum. The common saying among this class is, that when the light is not good the tube is not high enough, while probably it is too high to do the best work.

In my experience the tube which shows the bones dark on the screen and will only back up a parallel spark of less than two inches when excited by a powerful coil is the one that will make a picture in the shortest time. This can be readily understood, as we all know with such a tube a larger number of rays are given off and we can secure the desired penetration by using sufficient potential and the proper amount of current.

When using a tube which will give the necessary penetration, and will only back up a small parallel spark, according to Ohm's law there would be very little current used up in resist-

* Read before the Clinical Society of the New York School of Physical Therapeutics, February 19, 1904.

ance in comparison with one which backs up a long parallel spark between the terminals. For this reason I always attempt to secure a tube for radiographic work which is exactly focused to the anode, which will give a light that will easily penetrate the chest and will not back up a parallel spark of more than two inches. I have two tubes in which the internal resistance is extremely low, in which when the vacuum has reached a point where it will back up a spark of one-half inch and by using an inch spark gap on each side in series with the tube, a fine picture of the chest can be made almost instantaneously with a moderate amount of current going through the primary.

The above statement in regard to the internal resistance of tubes can be easily proven by making a radiographic test with two tubes, one will back up one-half inch and give sufficient penetration, while with the other it will be necessary to raise the vacuum to a point where it will back up from five to six inches before the same amount of penetration is secured.

When a tube which has a low internal resistance is used, it will be observed that the spark gap in series with the tube is exceedingly fat, while when the tube is used which has the greater internal resistance the spark gap is much thinner. Thus proving that the same amount of current is not passing through the tube, but that the greater part of it is being used up in resistance. Why two tubes which are made by the same firm, and seem to be identical in every way differ so greatly in the internal resistance is more than I am able to account for.

When the current is passing through a tube, providing it is one with which the operator is familiar, he can easily observe the degree of vacuum by watching the spark gap in series with the tube; even if the operator is in an adjoining room the ear will detect a change in the vacuum by the note of the spark gap.

There has been a great deal said and written about the best apparatus to excite the X-ray tube, but at present the induction coil has the preference. The induction coil which I prefer is one with three layers in the primary. For picture work I have been using a Wehnelt interrupter, and when using the three layers in series the coil draws 15 amperes and with one layer the interrupter being set the same 40 amperes are used. There has been a great deal said about what effect on secondary dis-

charge the three layers in series have, but there is no question that besides using less current and being less destructive on tubes that better work can be done.

When the tube is connected to the induction coil by a spark gap in series it produces two effects: first, the spark gap acts as a condenser which sends the current through the tube with greater force; second, if sufficient spark gap is used it cuts out a large portion of the reverse discharge, the direct and reverse discharge of equal volume, but the reverse discharge is of low potential, while that of the direct is exceedingly high. The reverse discharge is always present if the current is produced by an induction coil, and unless considerable spark gap is used it produces a certain amount of heating in the tube and no X-ray. This heating has a tendency to destroy the vacuum of the tube.

After the plate has been properly exposed, the development must not be overlooked if the operator expects to produce the best results. A great many different formulæ are used by the various operators including: pyro, metol, hydroquinone, metol-hydroquinone, rodinal, ortal, glycin, pyrocachin, etc.

A radiograph to be properly made must be properly timed and developed with a developing agent, which while reducing the silver will not in any way block up the shadows so as to make them opaque. In order to develop without producing any fog, and to secure a clear plate when developing a radiograph, I have had the best results either by using a developer with about one-fifth of the usual amount of alkali, or else using agents which will work with a large amount of bromide. The former method, which I have been using until lately, requires long development and towards the end of the process it is usually necessary to add more alkali. The formula which I have used most is the following:

Edinol.....	1 dram..
Sodium sulphite.....	10 drams.
Sodium carb.....	2 drams.

The same results can be accomplished in less time by using a developer very strong in alkali and a large amount of bromide. As edinol and hydroquinone works well with a large amount of bromide, I use a combination of these. Besides neither edinol or hydroquinone have as much tendency to produce fog as the others. The following works well:

Water.....	1 qt.
Edinol.....	2 drams.
Hydroquinone.....	3 drams.
Acetone sulphite.....	2 oz.
Potassium bromide.....	1 dram.
Potassium carbinate.....	6 oz.

Add and dissolve in the order named.

With the above formula a normally exposed plate will be developed in from six to ten minutes. If the plate is underexposed the development can be continued without any danger of fogging, while with many other formulæ the plate would be lost.

Acetone sulphite which is used instead of sulphite of soda has a tendency to give a clear negative, and is not acted upon by the air like the sulphite of soda. Edinol as a developer by itself gives a great deal of detail, and when developing a radiograph of the soft tissues cannot be excelled, but in most instances the results are better when it is combined with hydroquinone.

With efficient apparatus and a good tube comparatively short exposures can be made, and it is scarcely ever necessary to expose a plate over thirty seconds for any part of the body. The following for a patient weighing 140 pounds will produce good results:

Hand, one second, chest, from one to five seconds, gall stones, thirty seconds, kidney stones, thirty seconds, hip, fifteen to thirty seconds, knee, five seconds, and ankle, five seconds. The shorter the exposure provided the silver is sufficiently affected, the more detail will be shown, as there is always a certain amount of involuntary motion. If the exposure exceeds a second the movement may affect the sharpness of the images on the plate; this can be shown when making hip joint pictures of children where the exposure is almost snap-shot,—while if the time exceeded a few seconds the finer detail is seldom ever shown. In a radiograph taken in a few seconds some of the muscles of the hip and thigh as well as the structure of the bone will be shown, while if the time of the exposure is long the detail in the bone may be nearly as good, but that of the muscles is usually lost. The same holds good in the examination of any part of the body.

The apparatus and technique should not be considered per-

fect until we are able to make radiographs of any part of the body in a second or less.

It requires more care of the apparatus and tube to do quick work, because every part of the apparatus must be working properly or else we will fail to produce a good picture, while with a longer exposure, even if the light varied for a part of the time, the chances are that the plate will be sufficiently affected.

Many operators have said that it was impossible to locate gall stones, my experience has been very limited in these cases, but I have located gall stones in five cases. It seems, the secret of locating gall stones is chiefly in securing a plate which shows the necessary detail. In order to do this the picture should be taken while the patient holds his breath, and almost anyone can hold his breath for thirty seconds. I collected gall stones from four different cases, and placed a plate under a patient I was treating, the gall stones being directly under the liver, and made an exposure of thirty seconds. The gall stones which were of all sizes,—several almost as small as a grain of shot,—all showed when the picture was developed. The only question, do gall stones change in composition when they are exposed to the air?

A standard plate for gall stone should show the upper border of the liver and each rib that overlaps the organ, as well as the articulations and processes of the vertebræ.

I have seen operators make a negative diagnosis of gall stones, when the plate scarcely showed the spinal column and no trace of the ribs showing through the liver. Since the ribs are of a greater density than a gall stone how could one expect to make either a positive or negative diagnosis with such a plate.

Before we could make an accurate diagnosis of kidney stones it was necessary to first know what constituted a standard radiograph. A standard plate for gall stones must be of a higher degree, and certainly requires more accuracy in its production.

After a careful examination of the kidneys, ureters, and bladder if no stone is found a negative diagnosis can be made. Of course the plate should reach the standard before either a positive or negative diagnosis is made. It should show the articulation and process of the vertebræ, outline of the last ribs,



Deposits in bladder caused by lympho sarcoma. Skiagraph by Russell H. Boggs, M. D.

psoasis muscles, and in most cases the outline of the kidneys. A positive diagnosis should never be made from one plate, as there might be an imperfection in the plate. I have located pus in the kidney in three cases, each of which were verified by operation.

The following cases I will report :

Mrs. B., was referred by Dr. Buchanan to verify his diagnosis of kidney stone and pus. The patient had pain in the region of the kidney for four years. During this time she had several slight attacks of kidney colic, and the last six months she began to pass pus and became greatly emaciated. It was only after a radiograph was taken that she consented to the operation. Dr. Buchanan operated, thus verifying the radiograph. Dr. Buchanan suggested that all cases should not only be examined by the X-ray to prove the diagnosis but as well for an operation for kidney stone to ascertain if all the fragments of the calculi had been removed.

Mrs. B., aged 38, was referred to ascertain whether a kidney stone was present before the surgeon operated for the purpose of draining the kidney. An exposure was made of 55 seconds without first having the bowel thoroughly emptied. The radiograph showed all necessary detail, that is, every articulation and process of the vertebræ, outline of the last ribs, psoasis muscles and both kidneys. It showed the right kidney to be enlarged, and displaced, and over the crest of the ilium a spot about the size of a marble, and three smaller spots in the pelvis. As these spots showed on two plates, I suggested that the one over the crest of the ilium was a stone in the kidney, as the organ was displaced downward, and that the spots in the pelvis were hardened fæces.

As the operation was indicated whether or not a stone was present, she went to the Mercy Hospital and was operated upon by Dr. Werder. There was a large amount of pus present, which was very offensive but no stone. This proved that this as well as the other densities were hardened fæces. This showed the importance of cleaning out the bowel before making a radiograph for kidney stones. Never before have I seen fæces show so distinctly on the plate, and in all other cases I was able to make a positive diagnosis before the operation.

Many surgeons in the past have stated that it was not neces-

sary to have patients examined by the X-ray for the purpose of making a diagnosis of vesical calculi, but all radiographers know this statement should be modified.

The accuracy of the sound cannot be compared to a radiograph either in the diagnosis, or in detecting the size, shape, and number of the calculi. I will report the following case to illustrate:

Mr. L., aged 57, weight 225, was referred by his family physician for an X-ray examination for a suspected stone in the bladder. I happened to recall the fact that about two years previous in the absence of his family physician I was called in to prescribe for the patient, and found him suffering from a very severe attack of kidney colic. Six months ago he consulted his physician and he recommended a radiograph instead of sounding for the stone. This was postponed from time to time, the symptoms became gradually more severe, until he finally came for the examination. Two radiographs were taken, one in anterior and the other posterior position, the exposure of each was one and one-half minutes.

Each radiograph showed a large stone present. Just before the operation the patient was sounded but no stone was detected. As the surgeon had operated before with a radiograph as the only means of a diagnosis, he did not hesitate to do a perineal section. After the bladder was opened and considerable search made, he was unable to detect a stone, he decided that the shadow on the plate must have been caused by an enlarged prostate. Looking at the radiograph again, it was seen that the shadow was of greater density than the bones, and, therefore, must have been caused by a phosphatic stone instead of an enlarged prostate. Another effort was made and this time the stone was found.

After the operation the surgeon said, that the stone could neither have been diagnosed, nor removed without the use of the radiograph.



RADIANT FREQUENCY TRANSFORMATION OR
FLUORESCENCE.

BY MARGARET A. CLEAVES, M. D.

The phenomena of fluorescence is one that has interested the physicians to a very considerable extent ever since the Roentgen ray was assigned a place in medicine. This interest has grown with the development of high frequency currents and the use of vacuum tube discharges as well as with the interest in and more general use of light.

The phenomena of fluorescence (discovered and named by Stokes) depends upon the ability of some substances to absorb energy of radiation at one length and to emit it as a radiation at a greater wave length. This absorption does not occur at all parts of the spectrum but may be in several parts, generally contiguous to one another. The energy of radiation which the fluorescent substance emits is not monochromatic, nor is it of all wave lengths like white. This absorption and emission is distinctly selective. The phenomena of fluorescence is dependent upon temperature. In other words a fluorescent substance is to be looked upon as a radiant frequency transformer. Such a substance is silicate of zinc, commonly known as willamite. Willamite fluoresces under the influence of the Roentgen ray, cathode rays, ultra-violet rays and vacuum tube discharges. It is in common use among physicians for the purpose of testing the various sources of radiant energy used therapeutically. It is also used to test vacuum tube discharges which cause it to functionate as a radiant frequency transformer, and from the result obtained, *i. e.*, fluorescence, vacuum tubes have come, incorrectly however, to be regarded as a fertile source of ultra-violet rays. Such is not the case, and this fluorescence is without question due to the influence of the high frequency discharges therefrom. The fact of its so functioning under their influence is simply an indication of the near kinship of light and high frequency currents. Electrical and luminous vibrations do not differ physically other than by the frequency and wave length. And the work of Tesla with vacuum tube discharges, supplemented as it has been by many other brilliant experimenters, resolves itself simply into raising the frequency of an alternating current until the rate, or

frequency, is equal to the velocity of light without heat. Diverging for a moment, it is interesting to note how the fad of the day in electrical discharges, stands after all by reason of its physical laws and physiological action in close relation to radiant energy or light. And upon light, everything in nature depends, and without it the world were void.

Not only does willamite among the minerals possess the ability to act as a radiant frequency transformer, but other substances as well, for example, diamonds.

In the vegetable kingdom there are also substances which functionate as radiant frequency transformers. Among these may be mentioned quinine, esculin, resorcin, eosin, fluorescin; also an alcoholic solution of stramonium. Magdala red fluoresces in alcohol, amyl alcohol, and acetone. Petroleum jelly and other coal tar products are also fluorescent. But there is no radiant frequency transformer which concerns the physician so nearly and none of greater interest than the blood of the living organism. The normal fluorescence of the blood was discovered by Dr. Henry Bence Jones in 1866. He found during his investigations that the blood in all the organs of men and guinea pigs contained a fluorescent substance, to which he gave the name of animal quinoidine. In this fluorescence of the blood in normal living tissue is to be found, the writer believes, the key note of the response of the living organism to the action of radiant energy.

It is known in one disease at least—malaria—that the blood loses its power to functionate as a radiant frequency transformer, and that the remedy for that disease is to be found in a substance which, under exposure to ultra-violet light or the higher of the visible chemical frequencies of the spectrum, absorbs the higher energy of radiation and emits it at the lower, but still within the chemical frequencies of the spectrum. This is shown by the characteristic coloring, blue, of a solution of quinine sulphate when exposed to the chemical frequencies of light.

That the living organism is an energy transformer admits of no question; it may also be regarded as a radiant frequency transformer as well, and the measures physical or medicinal, which enables it to functionate normally in both capacities, are indicated in the treatment of it in a condition of disease, or for the maintenance of health.

Fluorescent substance may be administered in suitable doses and the patient then exposed to (1) sunlight, (2) incandescent light, (3) arc light, (4) Roentgen ray and (5) radium for the purpose of utilizing the substance or drug to secure (1) more efficient transillumination of the tissue for diagnostic purposes (Kemp); (2) as a therapeutic measure (an Italian physician and Morton). In both instances the substance used receives energy of radiation of the shortest wave length, for as a rule it is the violet and ultra-violet rays which undergo an alteration of refrangibility and emits them at a longer wave length. In the case of fluorescin used by Kemp for purposes of transilluminating the stomach, the visible chemical frequencies emitted by the incandescent stomach lamp are absorbed by the fluorescin and given off at the frequencies just below, or those frequencies which in the spectrum are known by the color of green. This green fluorescence enables a much more clear and thorough investigation of the stomach outlines and condition than simple transillumination by means of light. Its use is suggested by Kemp in cystoscopy and it should be of value to the genito-urinary specialist.

By the use of the water-cooled vaginal lamp devised and used by the writer ten years since, for the purpose of transilluminating the pelvic tissues, and since used for the treatment of a variety of gynecological conditions, fluorescent substances in solution can at will be substituted for the water and by closing the out-flow tube of the obturator be kept within the vagina. In this way any value that the transillumination might have in diagnosis, can be utilized, and at the same time the therapeutic effect of the radiant frequency transformer may be availed of. Theoretically, the method should be of value in the treatment of gonorrhea involving the vagina, uterus, tubes even, as well as of the bladder, both in men and women. The method is simple enough. The fluorescence insures light, and the gonococcus, a lover of darkness, may be obliged to yield its vantage ground.

But when it comes to be a question of the action of definite physical laws, within the living organism, the solution is not so simple as outside of the body. While the destruction, for example, of the gonococcus, might take place outside of the body, it is a very different problem as to what action would be had upon it inside of the body under the visible frequencies

emitted by a quinine solution for example. There is no question of destruction at one fell blow, as it were, but if there were a bactericidal influence it would be the same as with the short high frequency vibrations of light on bacteria, an inhibiting action, for ultra-violet frequencies act upon bacteria by reason of their short length and great frequency to shake them up, agitate them, compel them to give up little by little their energy until they are ready to cry quits. At the same time physiologic resistance is increased by their action on the blood as a radiant frequency transformer.

Fluorescence then is an absorption of certain rays and the emission of others, and the part of the spectrum selected or energy of radiation depends upon the substance. Rays of light, however, which have passed through a sufficient thickness of a fluorescent substance lose thereby the power of exciting fluorescence when they are passed through a second layer of the same substance. For example, a test tube containing a fluorescent liquid is brightly luminous when exposed to the sun's rays, or an artificial source of light chemically active, but loses this luster at once when dipped in a trough or another test tube of the same liquid, on the front of which the sun's rays or the chemical frequencies of the artificial light falls. The same results are noted upon comparison of the absorption spectrum of a fluorescent substance with the appearance presented by it when the spectrum falls upon it. When the fluorescence begins, then also begins the absorption, and a maximum of absorption means a maximum of fluorescence.

In view of these physical facts it is questionable whether, from the administration of drugs and exposure of the patient's body to the action of the X-ray, radium or light, absorption and emission of radiation is not interfered with by the successive tissues through which the energy acts. The contrary would be expected from the use of fluorescent substances in accessible mucus cavities into which an incandescent light or a tube of radium is introduced; or where possible, a cavity filled with the fluorescent drug in solution can be exposed to the action of the Roentgen ray by placing the tube within it. The subject is an interesting one and will bear clinical observation. And by it all there is suggested the thought, that the physician, to be a physician in the highest sense, should be a physicist first and a physician afterward. Physical science stands ready to unfold manifold illuminating fact and experiment upon many a darkened page of medical science.

REPORT OF THE COMMITTEE ON CURRENT CLASSIFICATION AND NOMENCLATURE.*

(Continued from page 153.)

When the potential differences are large there are evidently many paths of current leakage. The number of paths and the amount of leakage current increase with a rise of potential difference. Probably each of these paths acts as though it consisted of high resistances R in series with dielectric gaps G , as in Fig. 5.

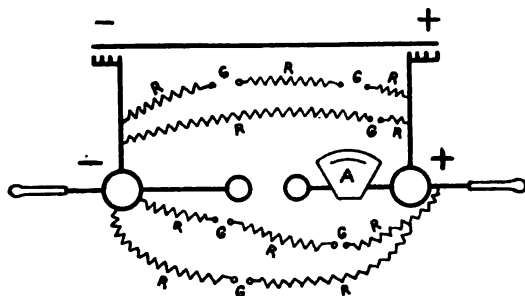


FIG. 5

Now this path does not conduct electricity until the potential difference between the combs or prime conductors '+' and '-' becomes sufficient to discharge through the gap. If the supply of electricity to this path is sufficiently great, that is to say, if the potential difference between '+' and '-' is maintained, or does not fall too low, the current will continue to flow, and will depend in magnitude upon the potential difference, and upon the value of the high resistance, plus the resistance of the broken-down gap.

The value of the equivalent resistance of all leakage paths combined in parallel for a given distance between discharge knobs can be found in the following manner:

Run the machine at such a speed that there occurs no discharge between the knobs and so that if the knobs were brought slightly nearer to each other a discharge will take place.

* Read at the Thirteenth Annual Meeting of the American Electro-Therapeutic Association, at Atlantic City, September 24, 1903.

Under these circumstances all the current that the machine produces escapes through the leakage paths and at a voltage corresponding to the break-down voltage between the knobs. Calling this voltage V , and the current which the machine produces at this speed I , the value of which is determined by measuring the amperage with the discharge knobs in contact, then the equivalent resistance R of the leakage paths is

$$R = \frac{V}{I}.$$

The curve in Fig. 6 shows the relation found to exist in machine No. 2 between the discharge knob gap and the needle

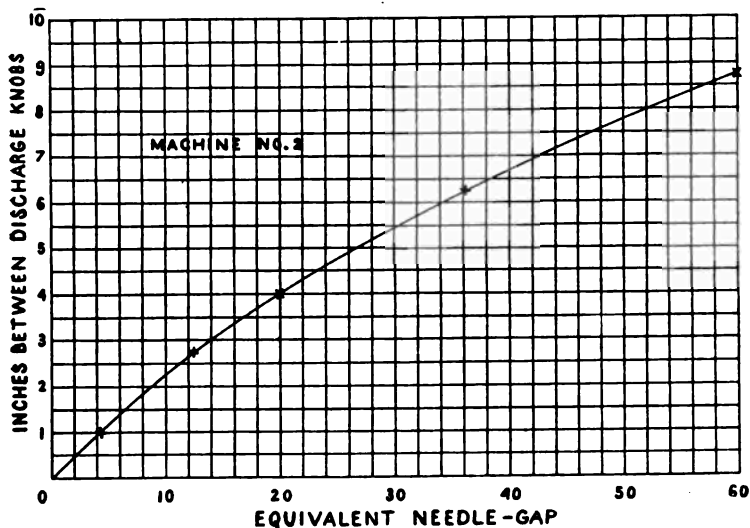


FIG. 6

gap. For example, in this machine, an E. M. F. which will barely cause a discharge when the needle-points are separated 10 inches, will also barely cause a discharge when the knobs are separated $2\frac{1}{4}$ inches. Similarly the higher E. M. F. which will discharge across a 20-inch air-space between needles, will cause a spark to pass only 4 inches between these particular knobs.

In machine No. 2 with a knob gap of $8\frac{3}{4}$ inches, which was found by a parallel needle gap of 60 inches to correspond, according to the curve in Fig. 2, to an interpolated voltage of

530,000, the speed was such as to yield a current of .000162 amperes. This gives the value of the combined leakage resistances as 3,270,000,000 ohms.

If it be assumed that there is also an internal resistance in a Holtz machine, which corresponds to the internal resistance of a storage cell or a dynamo, then this resistance may be considered to be located between the collecting combs, by the way of the air-gaps between the combs and revolving plates, and the plates themselves; the air-gaps as a whole and the plates as a whole being connected in series, and in series with the main circuit. Certainly this portion of the circuit is associated with a loss and its magnitude, as a resistance, can be determined.

In No. 1 machine, under the head of efficiency, it was shown that this loss was 79 watts, it being assumed that there is no loss due to dielectric hysteresis. The short-circuit current at this time was .000597 amperes. Since the loss in watts is equal to the product of the resistance and the square of the current, the resistance

$$R = \frac{P}{I^2} = \frac{79}{(.000597)^2} = 220,000,000 \text{ ohms.}$$

Disregarding this internal resistance and considering the circuit as supplied with constant current at the collecting combs, the arrangement can be represented diagrammatically, as in Fig. 7.

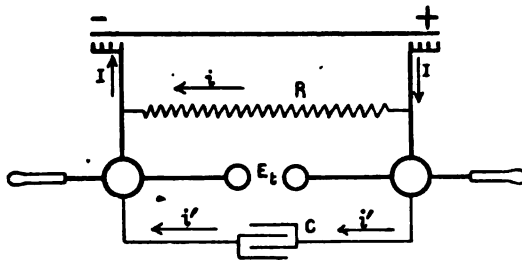


FIG. 7

In which
 I = current, in amperes, of constant value flowing from the plates to the combs on the positive side of the machine, and

from the combs to the plates on the negative side, and through the external circuit.

R =resistance, in ohms, equivalent to the combined resistance of all the leakage paths external to the plates and combs.

C =capacity, in farads, of a condenser having a capacity equal to that between the discharge knobs of the machine.

E_t =potential difference, in volts, between the discharge knobs at time t .

Q_t =quantity of electricity, in coulombs, bound up in the condenser C at time t .

i =leakage current flowing through the leakage resistance R at time t .

i' =current flowing into the condenser C at time t .

And
$$Q_t = C E_t = \int_0^t i' dt, \quad (1)$$

from which
$$E_t = \frac{\int_0^t i' dt}{C}. \quad (2)$$

But
$$i = \frac{E_t}{R} = \frac{\int_0^t i' dt}{C R}, \quad (3)$$

and since $I = i' + i$,
$$I = i' + \frac{1}{C R} \int_0^t i' dt. \quad (4)$$

Differentiating equation (4) with respect to i' , we have

$$0 = di' + \frac{1}{C R} i' dt,$$

from which
$$\frac{di'}{i'} = - \frac{1}{C R} dt,$$

or
$$\log_e i' = - \frac{t}{C R} + \text{Constant}.$$

Since for $t=0$; $i'=I$, we have for the value of the constant, $\log_e I$, and the final expression for the last equation becomes

$$\log_e i' = - \frac{t}{C R} + \log_e I, \quad (5)$$

from which
$$\frac{i'}{I} = e^{-\frac{t}{C R}},$$

or

$$i' = I e^{-\frac{t}{CR}} \quad (6)$$

The current-time curve for the current i' , which flows into the condenser C , is, therefore, of the form shown in Fig. 8.

If there be no leakage, however, in which case $R = \infty$, then the current i' is constant and equal to I , the total current delivered by the plates to the combs.

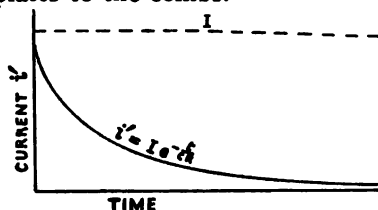


FIG. 8

The current-time curve for the leakage current i , which flows through the resistance R , is equal to the difference between the total current I and the current i' flowing in the condenser circuit, and is of the form shown in Fig. 9, or the curve of Fig. 8 inverted.

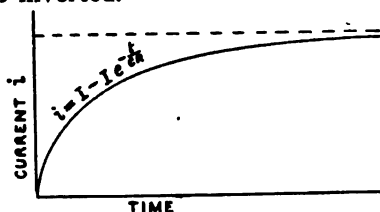


FIG. 9

If there be no leakage, however, $i = 0$, and the horizontal zero, or base, line of Fig. 9 will then be the curve for i .

If there be no leakage, and therefore the total current I flows into the condenser, it is evident that the potential difference between the knobs at time t will be represented by the equation..

$$E_t = \frac{It}{C} \quad (7)$$

With leakage present the value of E_t is obtained by substituting, in equation (3), the value for the condenser current i' given by equation (6), and is

$$E_t = \frac{1}{C} \int_0^t I e^{-\frac{t}{CR}} dt, \quad (8)$$

or

$$E_t = R I (1 - e^{-\frac{t}{CR}})$$

The time curves of potential difference between the knobs are of the form shown in Fig. 10, that for no leakage being, as the character of equation (7) indicates, a straight line.

In the equation $E_t = \frac{1}{C} \int_0^t I e^{-\frac{t}{CR}} dt,$

if the upper integral limit be taken as the time elapsing between sparks, then t is equal to the reciprocal of the number of sparks per second, a large number of which per second can be accurately counted after a little practice by use of some scheme of rhythmic accentuation. E_t then becomes equal to the voltage necessary to break down the gap and can be found

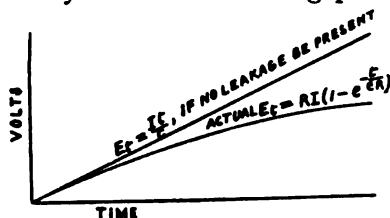


FIG. 10

by the equivalent parallel needle-gap. The supply current I at the appropriate speed can be found by the voltmeter. There remains but C and R as unknown quantities.

The capacity of the machine may be increased and rendered negligible by the addition of sufficient known capacity. The capacity C of the formula then becomes known, and the average value of R can then be calculated.

Probably of more interest is the use of this formula for the comparison of capacities of small magnitudes, such as are used in wireless telegraphy. No. 1 machine was called for and returned before some experiments along this line had been completed.

Some of the peculiarities of the results summarized in the table, Fig. 3, can now be more clearly understood. As the proportion between observed current and leakage varies widely with variations of potential difference, it is easy to account for the fact that a rise of watts *input* at the driving motor, amounting to 40 per cent. (from 126 to 174) yielded a rise of watts *output* of only 14 per cent. (from 34 to 39); also for the fact that a further rise of watts *input* accompanying the increase of gap-distance from 12 to 18 inches, and of voltage from 122,000 to 180,000, amounted to only 3 per cent. (from 174 to 180) and resulted in a fall of watts *output* from 39 to 35 (10 per cent.) because of increase of leakage both as to its total amount and its ratio to total current generated.

Between the extremes of spark discharge (6 inches and 18 inches), at which distances the *output* in watts was substantially the same, the *input* rose nearly 50 per cent., all of which increase disappeared as leakage, in the use of the 18-inch gap causing the efficiency to fall from 27.1 per cent. to 19.5 per cent.

(To be continued.)

ON THE PHYSIO-PATHOLOGICAL ACTION OF THE
HIGH-FREQUENCY AND HIGH TENSION CUR-
RENTS ON THE NORMAL SKIN. HISTOLOGICAL
RESEARCHES.

BY DR. G. AREINZO AND DR. S. FABROZZI, NAPLES, ITALY.

(Continued from page 168.)

Fourth Experiment.—Pieces of skin were taken from *rabbit No. 1* after four days of treatment by resonator for twenty minutes per day; an umbilicated crust was very apparent with reddening of the edges of the healthy skin.

In the microscopical cuts, the facts shown in the preceding case were noticed, but much more accentuated and with complete destruction of the epithelial layers and substitution of granular substances more or less coagulated. With complete leucocytic invasion of the subcutaneous connective tissue beneath the lesion and in which the phagocytosis was much accentuated, and the infiltration of the yellow pigments could be observed, whilst on the margins, an active hyperæmia with leucocyte infiltration could be observed.

Fifth Experiment.—After five days of the electrical application for twenty minutes per day, we took pieces of skin off from *rabbit No. 2*, and in the same way from *rabbit No. 3*. In both animals umbilical crusts are apparent at the place of application, whilst around a girdle of reddening could be observed for about half a centimeter.

By the microscopical examination, the same things as in the preceding case could be observed, but brought to the last grade; in fact, where the necrosis of the epithelial layers was complete, as the leucocytes and the masses of yellow pigment were at a maximum. In the periphery the points had not been influenced by the effluve, and there was a hyperæmia very much accentuated, and leucocyte infiltration, and in several points was confused with the existing subcutaneous infiltration at the point to which the application was made from the resonator.

Phenomena of the Recovery.—*First Experiment.*—After having made the usual five applications to *rabbit No. 4* from the resonator, twenty minutes at a time, we waited until four days after the last application, and then the cutaneous pieces were cut out and treated in the usual way.

Microscopically, it was noted that the crust that had formed

began to be lifted up near the edges, where it detached itself, whilst the hyperæmia was noticeable enough. In the microscopical preparations, an involuted phenomena was observed in the pathological process that verified itself at the part of the skin to which the application had been made; in fact, the epithelial marginal cells of the skin entered into a very active proliferating period and the deep cells insinuated themselves edgewise into the cavity left by the crust that was becoming detached.

In these cells of the epithelium all the evolutive stages observed by the experimenters were found, also in the scar's constitution. In the center and for a certain space around, were observed signs of leucocyte infiltration with phagocytosis very apparent.

In the subcutaneous connective, new granular formations are noticed, and also those phenomena of hyperæmia.

Second Experiment.—The pieces of skin were taken from the fifth rabbit and treated in the same way as the preceding one. On them an almost complete rising of the crust was noticed after seven days from the electric application.

In the microscopical cuts, the complete regeneration of the cutaneous epithelial layer was seen, except for a little space near the center, in which was still noted the form of necrosis that constituted the crust; whilst the connective tissue underneath was formed of cells almost fibrous. The leucocyte infiltration was minimum.

Third Experiment.—After ten days, the pieces of skin were removed from the rabbit No. 6 and treated as the preceding ones. The crust was no more noticeable in them, but there was slight reddening of that part, with a complete glaze of the skin and absolute want of hair.

The microscopic examination disclosed complete regeneration of the different epithelial tissues, with a very slight hardened layer. And here and there, especially toward the margins, there was beginning formation of the glands and hairs.

The leucocyte infiltration had disappeared and in the subcutaneous connective tissue could be observed a very slight infiltration and little spots of yellowish pigment. The connective tissue cells were almost fibrous, and only here and there could be noticed some young connective tissue formed for the greater part of fibroblasts, and that especially toward the center of the lesion produced.

High-Frequency.—First Experiment.—Rabbit No. 1. One single application is made to several points of the skin, and, after twenty-four hours in these places could be noticed a blister of elastic consistence with slight reddening of the edges.

In the microscopical cuts, in the epithelial cells was noticed a dropsical swelling, and in the meshes of the subcutaneous connective tissue was a slight infiltration of leucocytes.

Second Experiment.—Rabbit No. 2. The cutaneous pieces were removed after two applications. At the place of application the presence of the crust began already to be noticeable. In the microscopical preparations, besides the presence of dropsical swelling and the affection of the epithelial cells at the margins, toward the center was noticed the same peculiarities noted with the resonator after one administration.

Third Experiment.—Rabbit No. 2. The cutaneous pieces removed after three electrical applications presented the umbilical crust well formed, and under the microscope, were observed what has been described before from the application of high-frequency.

In the fourth, fifth and sixth experiments, made respectively on rabbits 1, 2, and 3, in the pieces removed after four and five days were noticed the same results as from the resonator.

Recovery Phenomena.—The experiments done with resonator were made by us on three rabbits always, naturally, on different parts of the skin, and the cutaneous pieces removed respectively at different epochs permitted us to make the same report as we have above described, until the tenth day on which the last piece was removed, and the complete recovery by regeneration of the epithelium had not been noticed, the same as for the hair, the formation of which had not been observed.

To recapitulate what we have been able to observe in the experiments instituted by us, is in one case as in another, that is to say, with the resonator and by the high frequency, there is a loss of epithelial substance first, by coagulation necrosis in the first case, and by dropsical degeneration followed by coagulation in the second case, with infiltration of leucocytes and phagocytosis in the subcutaneous connective tissue; and secondly, when diminishing the action of the current in both ways, there is a complete regeneration of the epithelial strata of the skin with the formation of scars as with surgical cuts. The formation of epithelium by regeneration proceeds as in all the processes of cicatrization.

So we think that on the side of esthetics, there is a gain when a destruction of cutaneous substance is desirable as in several surgical cases.

And then who knows but that the predilection for destroying the epithelial elements might have indications much more important in the cure of cutaneous epitheliomas.

We are busying ourselves with the question, and are also studying the influences exerted by the above currents upon scars, and experiments are being made on the cornea that will soon be published. Several experimental observations have already been made and are being made, and we will certainly bring practical contributions to the æsthetic of the scars and on the electrical applications on the cornea.

Editorial.

THE PHYSIOLOGICAL RELATION OF VIBRATION TO THERAPEUTICS.

THE study of physical therapeutics is the study of vibration applied to the treatment of pathological processes.

The differentiation of rates of vibration requisite to affect various conditions, and restore normal relations of rhythm and coincidentally facilitate the elimination of inflammatory and waste products is a subject worthy of thoughtful consideration.

Physiologically the heart impulse and the respiratory function induce involuntary impulses with regularity and of moderate frequency in association with the great life processes and, continue uninterruptedly during the period which spans the life of the individual. Muscular action also induces vibration in both voluntary and involuntary impulses. The performance of these physical functions in response to voluntary and involuntary stimuli are associated, we are told by recent scientific investigators, with emanations and radiations akin to light and forms of vibration similar to the X-rays and the radiations of radium.

The relation of thought and vibration and the aura that unseen emanates from the individual, in response to psychic impulses, is also associated with vibratory impulse affecting the ether, and conveying to other individuals impulses which in response influence thought without the transmission of sound—the telepathic message.

The normal environments in which we live surround us with the influences of vibration,—atmospheric and ether vibrations in the form of light, heat, and the influences of electricity and magnetism. Electricity induced so abundantly in nature, occupies no small place in the functions of the normal economy, undoubtedly exciting in the tissues vibratory impulses of varying frequencies, the full knowledge and import of which, may never be fully understood. The actions taking place within the body by chemical combination, produce vibratory effects which are evidenced by the production of rates comparable to those which are characteristic of light and heat.

It must then be recognized that in its complexity, the study of vibration from a relative standpoint is one involving problems so intricate that their full solution will probably never be accomplished by future generations.

There is undoubtedly in each individual a varying rhythm and rate of frequency associated with the performance of the various functions which, while relatively the same in the species, are essentially different in each individual. These variations probably explain many individual idiosyncrasies and other peculiarities.

The study of various frequencies of vibration in therapeutics is the study of their adaptation to natural physiological conditions—the rates required to restore the normal actions. The curative action of vibratory impulse depends upon the character of the vibration and its adaptation to the effect demanded. The effects of the extreme rates of vibration of the ultra-violet and X-rays have in recent years been shown to produce wonderful results. The valuable therapeutic effect of radiant heat, dry heat, and moist heat, are undoubtedly produced through vibratory influences.

The influence of electricity in the various proportions of quantity and potential and extremes of frequency are distinctly vibratory in character, the different rates of which are adapted to the treatment of different conditions.

Mechanical vibrations which practically includes massage exercise and the vibrations induced by machines are of the most familiar types, and are demonstrated to be of very great value in therapeutics. They are not the vibrations that effect neoplasms, nor do they induce the muscular contractions and polarization effects of the electric currents. Each form of vibration in varying frequencies has its special field of usefulness, the combined use of which is certain to revolutionize modern medicine.

* * *

THE QUALITY OF THE ANTI-CATHODE OF THE X-RAY TUBE.

THE manufacturers of X-ray tubes have for some time been employing a thin coating of platinum rolled upon the surface facing the cathode in the anti-cathode of X-ray tubes. In a short time this surface becomes blackened and denuded of the

platinum when instead of having a platinum surface, there remains but a cheaper, grosser metal. The manufacturers' excuse for this, is that dealers in X-ray tubes demand that tubes be constructed so cheaply, in order that a larger margin of profit may be left for them. These reasons are petty ones and seemingly inexcusable to the physician who must buy and use them. It would be better for the medical man to add to the price of his X-ray tube the cost of a solid platinum anti-cathode, and it would be but fair that he should receive in return a rebate for the intrinsic value of the platinum employed on the purchase price of his next tube.

* * *

THE MEETINGS OF THE AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION AND THE CONGRESS OF ELECTRO-THERAPEUTICS.

IT is generally understood by the members of the American Electro-Therapeutic Association that the next annual meeting of the Association and the Congress of Electro-Therapeutics will meet during the week of September 12 to 17, inclusive, at St. Louis. These meetings are both of so much interest to every member of the Association that those who attend can ill afford to miss the session of either. It is, therefore, desirable that it be arranged that these sessions meet at hours that do not conflict with each other.

Those members of the Association who have not made application for membership to the Congress can do so by sending their application fee of \$5 to the Secretary of Electrical Congresses, Dr. A. E. Kenelly, Harvard University, Boston, Mass. They should do so early and receive their tickets, or they will be otherwise debarred from attending the sessions of the Congress.

* * *

DR. OGDEN C. LUDLOW.

THE friends of Dr. Ogden C. Ludlow were shocked to learn of his untimely death, from typhoid fever, at his home, on March 2. The Editor and other members of the American Electro-Therapeutic Association extend their sympathies to his bereaved wife and family.

Progress in Physical Therapeutics.

CURRENTS OF HIGH FREQUENCY AND HIGH POTENTIAL.

EDITED BY WALTER H. WHITE, M. D.

The Use of Currents of High Frequency in Diseases of the Digestive Organs. By G. Herschell, M. D., London. Int. Med. Journal for December.

There is no exaggeration in saying that these currents put an entirely new power in our hands in treating this class of diseases and enable us to effect cures in cases which with other measures have proved useless. In order to select cases in which they are likely to prove useful it is necessary to understand broadly what action they have upon the human body, and what we can effect with them. By a general application, such as auto-condensation, or less efficiently by placing the patient in the circuit obtained by derivation from two spires of the solenoid, we cause the body to be permeated with electricity at a potential of perhaps a million volts and probably having about the same number of alternations per second. The effect of this has been proved experimentally by D'Arsonval, Marie, and many other observers, to increase the metabolism of the body and incidentally to cure all those cases of neurasthenia which depend upon autotoxins from perversion of the nutritional functions of the tissues. By the local action we may obtain quite opposite effects upon the body, according to the method in which it is applied. (1) They may act as a sedative to nerves and glands. For this purpose we use the resonator current applied labile to the body by metal or by moistened felt-covered electrodes.

(2) We may exercise a stimulating effect upon glands and nerves. We effect this by the local application of the solenoid current, interposing a layer of dry cloth between the metal electrode and the surface of the body, or using an electrode consisting of a flat glass vessel containing salt and water. We may produce the same results by means of what are termed condenser electrodes or by the use of high vacuum electrodes connected with the top of the resonator.

(3) We may secure muscular contractions by placing the spark gap in the current derived from the two ends of the solenoid and applying it by means of two moistened electrodes to the body of the patient, in fact, using it in exactly the same manner as the static induced current of Morton.

The key, then, to the understanding of the effects of the cur-

rents of high frequency is to remember that they can be made to exercise a manifold action; viz., to increase metabolism, to allay sensibility, to stir up the sympathetic system of nerves and increase or diminish the functions of glands, to tone up unstripped muscular fiber, and incidentally to act as a general tonic.

As regards my personal experience of the clinical uses of high frequency currents, I propose to take Boardman Reed's questions and discuss them *seriatim*.

(1) *Are high frequency currents of any avail in any form of gastrointestinal catarrh?*

The only forms in which I have found them of use are in the so-called intestinal neuroses of secretion. I mean mucomembranous colitis. In several cases of this nature its use has promptly relieved the paroxysms of pain, and after a course of several weeks the patient's condition was evidently materially improved. In these cases the application was made with one electrode in the rectum and a large wetted piece of lint under a metal plate upon the abdomen. The current was taken in derivation from twenty-one spires of the small solenoid of D'Arsonval's apparatus, the milliamperemeter registering from 400 to 500 milliamperes.

In gastric catarrh, *i. e.*, chronic mucous gastritis, I have not yet had any experience, as I have not yet succeeded in devising an electrode by which the effluve from the resonator can be applied directly to the mucous membrane of the stomach. When this can be accomplished, we may, I think expect good results to be obtained. The percutaneous method and the method with electrodes in contact with the lingual mucous membrane, whilst exercising sedative effects upon the nervous mechanism, do not appear to influence inflammatory processes. For these we require the effluve or the sparks from a condensing electrode.

(2) *The use of the currents in constipation of atonic or of spastic origin.*

Currents of high frequency will do good work in both these conditions, but to produce the specific effects must be applied in a different manner for each.

(a) For atonic constipation. In treating this affection we have two objects in view. First of all, to improve the innervation of the intestines. We accomplish this by the stable use of the solenoid current, applied by means of an electrode in the rectum and one upon the abdomen. We raise the tone of the whole nervous system by autocondensation on the couch, and we stimulate the nerve centers in the lumbar region by the local application of the sparks from high vacuum electrodes.

Secondly, we try to improve the tone of the abdominal and intestinal muscles. For this we use the current from the

solenoid, but we insert a spark gap in the circuit, which will give it the power of causing muscular contractions of a singularly painless nature. One very good method of administering the current for this purpose is to use the hand of the operator as an electrode, one pole of the solenoid being attached to a metal band round the wrist and the other to a metal electrode placed within the rectum. The abdomen of the patient is then gently massaged with the charged hand of the operator. This method is especially valuable in children. The spark gap should be adjusted to produce vigorous contractions of the abdominal muscles.

(b) Spastic constipation. As this is a local manifestation of a general neurasthenic condition, we should treat the patient generally upon the condensation couch at the same time that we apply the sedative current from the resonator to the abdomen. With Dean's apparatus both these processes can be carried on simultaneously, the patient lying on the condensation couch attached to the two poles of the solenoid, whilst to his abdomen is applied a large metal or wet pad attached to the top of the resonator. I have notes of several very successful cases.

In the treatment of some cases of constipation high frequency currents give very striking and brilliant results; in others, particularly those of very long standing, the triphase alternating currents of low tension appear to be more useful. As an example of rapid cure of atonic constipation, I may cite the case of a little girl, aged seven years, who came under my treatment upon June 8 of this year. She was a native of South Africa, and, since landing in England, four months previously, had been very constipated. On several occasions large doses of castor oil upon several successive nights failed to secure an action of the bowels, which was only procured by recourse to large enemata. Her parents were advised by Dr. Mathew, of Port Elizabeth, by letter, to bring the child to me, and I commenced treatment on June 8. There had then been no action for four days. Applications were given on alternate days, using the current from the solenoid with a spark gap in the circuit in the manner described—one pole in the rectum and one upon the abdomen. Two copious actions of the bowels took place shortly after the first application. Only three treatments in all were given, the patient ceasing to attend, as the natural daily function of the bowels appeared to be completely re-established.

(3) *The efficacy of high frequency electricity in gastric atony.*

According to my experience, good results are obtained in the slightest degrees of gastric atony which so often accompany general neurasthenia. In these cases, whilst yet able to empty itself in five or six hours, the stomach has lost its tonicity and

is unable to contract so efficiently upon its contents as to preclude the occurrence of splashing during practically the whole of the digestive period. In these cases a course of autocondensation, at the same time giving local applications of the interrupted solenoid current to the region of the stomach, will usually cure the patient in four or five weeks. In my experience the severer cases, which are marked by stagnation and retention of food residues, are more efficiently treated by means of the triphase alternating current with one intragastric electrode.

(4) *Painful gastrointestinal neuroses.*

(a) Gastralgia not arising from hyperchlorhydria. I have not had an opportunity of trying the effect of effluing the interior of the stomach in a case of this nature, as my electrodes are not yet completed.

(b) Intestinal colic and cramp. I have only had opportunity to try high frequency electricity in two cases, but in both with complete success.

The article by Dr. Herschell, of London, published in the December number of the *International Medical Magazine* is of such interest that we have inserted it at length in this issue.

Dr. Herschell criticises the Tesla coils on points which have now been largely overcome by the new Strong-Ovington High Frequency Machine, principally by the use of a third pole or "dummy" with a disk on one side, so that the "output" of the machine or strength of current to the patient can be controlled. This is done by attaching one cord to the "dummy" and sliding the rod of the active pole with its disk towards, or from, that of the "dummy," thus making use of the distance between the two disks as an air rheostat. In this manner metal electrodes can now be used as with the foreign styles of high frequency apparatus. For instance, Doumer's electrode in treatment of hemorrhoids, the metal point for contraction of muscles, the "disk" electrode with wet cloths for congestion, etc.

Formerly the trouble has been that the spark length was too long in other high frequency machines made in this country, and that the "static brush" discharge could not be produced without painful sparks jumping to the patient, now the "brush" can be approached to within three inches of the patient.

In making this machine the principal thing sought for was extreme high frequency in this type of apparatus, as the frequency is increased the actual spark length is reduced, when

the switch is set for the highest frequency the spark length between the terminals is not more than two inches.

For X-ray and other purposes where greater spark length is required a switch is turned when a much greater spark length is obtained, with a corresponding reduction in frequency.

LARYNGOLOGY, RHINOLOGY, AND OTOLOGY.

EDITED BY W. SCHEPPEGRELL, A. M., M. D.

The Principles of Rhinologic Practice.

In an interesting review on this subject, Dr. Edwin Pynchon, of Chicago (*Laryngoscope*, July, 1903), forms the following conclusions: In the normal nose the nostrils should be of equal caliber and should jointly have a sufficient capacity to at all times supply the requirements of easy nasal respiration. In the ideal nose the walls of the septum are practically plane, and are at no time or place touched by the tissues of the outer wall, in either passage, and, furthermore, no points of contact exist elsewhere therein, so as to interfere with either ventilation or drainage, or prevent the normal evaporation of nasal moisture. While in an ideal nose the septum is vertical and nearly plane, a moderate irregularity thereof will not impair the nasal respiratory functions, providing there are no points of contact or abrupt elevations therein, and the lumen at all points is sufficient. Abnormal redness of the nasal mucous membrane is an unfailing sign of irritation, the cause of which is generally of a structural nature, and, therefore, amenable to surgical treatment. The indications for operative interference depend upon both the subjective and objective symptoms. A noticeable inadequacy of either nasal passage, the presence of excessive or retained secretions, or an abnormal redness of the mucous membrane at any point, are all evidences of abnormality, which, if coupled with inconvenience to the patient, invite corrective attention. In the treatment of chronic hypertrophic nasal troubles, the indication is to remove all obstructive, redundant, or pathologic tissues, and at all times the chief indication is to cause the defective nose to conform as nearly as practical to the contour and character of the ideal standard.

Cases of Throat and Nose Diseases Treated by the X-rays.

This subject was introduced at the meeting of the New York Academy of Medicine by Dr. J. Edward Stubbart (*Laryngoscope*, July, 1903), who stated that in his own experience he had observed that in active cases of mixed infection daily exposures to the X-ray produced a decided diminution in the

number of cocci in the expectoration. Several observers had already insisted upon the bactericidal action of the X-ray. The first case reported was one of a new growth of the tonsil diagnosticated as sarcoma by a number of physicians. After treatment for some time by the X-ray the growth entirely disappeared, but just about this time the man developed a severe gastro-intestinal disturbance, associated with marked cachexia. He was now dying, though the diagnosis of the present condition was uncertain. In a second similar case retrogression sepsis suddenly developed, necessitating operation for evacuation of pus. A case of tuberculosis of the larynx complicating pulmonary tuberculosis and one of tuberculosis of the tonsil were reported. The latter improved more rapidly and decidedly than under the usual treatment. In a case of submucous hemorrhage of one vocal cord the application of the X-ray caused a prompt blanching of the cord. The next case was one of lupus of the nose, which had done well under X-ray treatment.

Death from the Bursting of a Tonsilar Abscess.

The agonizing pain and inconvenience to the patient suffering from a tonsilar abscess is generally recognized, but the danger of a fatal issue is not usually realized by the physician or the patient. The report, therefore, of two deaths in two consecutive numbers of the *Lancet* (September 20 and 27, 1902), the first by Dr. Alexander Lyons, and the second by Dr. F. de Havilland Hall, will be read with much interest. The possibility of death occurring is occasionally mentioned in works on diseases of the throat, but only a few reported cases are found scattered in medical literature. One is mentioned in Sajou's "Annual of the Universal Medical Sciences," in which the author examined a young woman who died suddenly the following night, and at the necropsy the larynx was found to be full of pus.

In the case reported by Dr. Alexander Lyons, a man, aged twenty-eight years, was admitted suffering from a very large suppurative tonsilitis on the left side. He was given a warm bath and put to bed, where he partook of a glass of milk. About half an hour afterwards the nurse in charge of the ward heard him coughing feebly, and on going to ascertain the cause was surprised to find him cyanosed, and the patient was dead in five or six minutes.

At the post-mortem examination it was found that the abscess had burst, and that a large amount of pus had got into the upper part of the larynx.

The Tonsils and Tuberculosis.

Escomel (*Jour. Amer. Med. Ass'n*, November 7, 1903, *Archiv. f. Gynäkologie*, Berlin) regards the tonsils as "the most

tuberculizable organs in the entire digestive tract." He found them the seat of tuberculous lesions in twenty-one out of twenty-five cadavers of consumptives examined. In eleven non-tuberculous cadavers the tonsils were intact. In the tuberculous cases the follicles almost always contained other parasites, which may have favored the lodgment and growth of the tubercle bacilli.

HYDROTHERAPY.

EDITED BY CURRAN POPE, M. D.

Hydrotherapy in Sciatica. By J. B. Cathomas. Die hydriatische Behandlung der Ischias. Correspondenz-Blatt f. Schweizer Aerzte, Basle.

Cathomas comments on the rapid improvement obtained in a number of cases of sciatica after a few Scottish douches. Some of them were old, rebellious cases, but they responded surprisingly to various hydrotherapeutic measures. The results obtained confirm the assertions of Winternitz and others who attribute neuralgias to disturbances in the circulation in the nerves. Glatz in No. 15 also reports excellent results from hydrotherapy in sciatica and other neuralgias. (Jour. Am. Med. Asso.)

Management of Fever in General.

A. A. Eshner (Jour. A. M. A., July 11, 1903) states that fever is most commonly due to changes secondary to infective processes, that is, to the toxic effects of the products of bacterial and cellular activity. It has been thought that elevation of temperature in the presence of infectious diseases is a conservative process, perhaps having antibacterial antitoxic value, but as to the accuracy of such a view the evidence is not conclusive.

The great problems that confront the clinician are to remove the cause as far as it is possible and to restore the metabolic equilibrium. It may be impossible to do much along the line first mentioned, but we have at our disposal emesis, catharsis, diaphoresis, diuresis, entroclysis, hypodermoclysis, and intravenous transfusion. Acting along the second line, we may employ various baths, and sustain the heart and lungs with the usual stimulants. Antipyretic drugs are not necessary, and their use is at all times attended with danger.

Typhoid Fever in Children. Adolf Baginsky. Boston Medical and Surgical Journal, Jan. 7.

As regards treatment, he remarks that children with typhoid cannot stand very cold baths, and the permanent lukewarm bath after the Reiss method is principally to be recommended. The child is laid on a sheet which is spread out in a tub be-

neath the surface of the water, and remains there for hours or days, according to the height of the fever. Children bear the cold pack well, and it may be well substituted for the cold bath. If possible, limit the antipyretic treatment to external methods, but if quinine is used it should be given in pretty good-sized doses. (Jour. A. M. A., Jan. 23, 1904.)

De la compresse hydrotherapique appliquee sur la poitrine (chest). C. Fernet. Semaine Medicale, Paris.

Fernet has been advocating for some years the application of a small compress wrung out of cold water in the treatment of congestion of the lungs in infectious diseases. He has found this procedure especially valuable in grippe, typhoid fever, pneumonia, bronchopneumonia, in congestion with œdema of the lung, in incipient hemoptysis, and in certain cases of tachycardia, particularly in exophthalmic goiter. The patients are liable to start and shiver at the first application, but the relief and benefit are soon so marked that they clamor for a repetition. He uses a napkin wrung out of cold water, covered with another folded in four to protect the clothing. He leaves it half a minute and then substitutes another. The total application is thus only one minute. If the procedure is repeated, the compress must be applied at another point, as the impression of sudden cold—which is the stimulating effect on the peripheral nerve terminals sought by the application—soon becomes dulled. He attributes its action to reflex influence on the pneumogastric and on the vasomotor nerves of the sympathetic system. The only contraindication he has discovered in fifteen years' experience with this simple method of stimulation is when the patient is in profuse perspiration, and in his own practice he does not regard this as a contraindication. He cites a case of attacks of dyspnoea and palpitations occurring in young women subsequent to diphtheria, reported by Duchenne, cured by faradization of the skin. The action of cutaneous faradization seems to him to be exactly similar to that of the cold compress. (Jour. A. M. A., Jan. 23, 1904.)

MECHANICAL-VIBRATION THERAPY.

EDITED BY FREDERICK H. MORSE, M. D.

A Case of Dysmenorrhœa treated by Dr. Lucy Hall-Brown, of Brooklyn, N. Y.

Miss J., aged seventeen, has suffered for last three years from a severe form of dysmenorrhœa. The pain was so severe that the body would be bathed in cold perspiration, and the patient would appear to be upon the border of collapse. Hypodermic injection of morphine alone gave relief.

She had been in the hands of an able gynecologist, who,

among other attempts to relieve her, had dilated the cervix and inserted a stem pessary, but no relief followed.

The patient slept badly, was extremely nervous, and so erratic in behavior as to cause her family and friends extreme anxiety.

The Chattoonooga vibrator was applied to the fourth lumbar and to the upper dorsal region, also anteriorly over the ovarian regions and the liver.

After the third treatment she slept soundly all night. Since beginning treatment her menstrual periods have been without pain. In all she has had eighteen treatments.

PSYCHO-THERAPY.

EDITED BY LESLIE MEACHAM, M. D.

An editorial in the London Lancet of January 9, 1904, describes experiments by M. Aug. Charpenter in studying Blondlot's "n" rays that seem to confirm the theories of believers in animal magnetism, and the physical basis of telepathy. "He observed that conditions similar to the 'n' rays were emitted by the human body and that the effect produced upon a sensitive screen placed at a little distance was proportional to the physiological activity of the part, being greatest in the case of muscle and nerve. By using a small screen and making the variation in luminosity which it exhibited he found it possible to map out the heart and to trace the course of nerves beneath the skin. That the phenomena was not due to heat simply was shown by interposing screens of aluminum or glass, which did not affect the result, nor could the rays be supposed to have been previously absorbed from some external source, since the manifestations were obtainable equally well after the part of the body under observation had been kept in darkness for nine hours. As yet it does not appear that this method of investigation has more than a theoretical value, but the same might have been said of the early stages of almost any application of scientific methods." (Monthly Encyclopedia of Medicine, February, 1904.)

"Auto-Suggestion: A Means of Self-Mastery Through Self-Discipline." By Laura May Westall. (Practical Psychology, February-April, 1904.)

The author, though evidently not a physician, has presented an excellent physiological explanation of the action of suggestion.

Some of the statements follow:

"To assert the physical basis of mind, the evolution of mind, and the co-ordination of mind and body, does not 'rule God out of the Universe,' nor is the position inconsistent with a truly religious conception of the universal." . . . Setting

aside the question as to whether the mind is an independent entity, this much empiricism has proven: that the brain is the organ of the mind, and that it reacts upon the stimuli delivered to it through sense channels, and that, as a result of this simple reflex act, sensation is mysteriously transmuted into consciousness. Also, that there are required many sensations of a given kind to be registered upon the nerve-cells before self-consciousness arises. Thus the infant brain must record a given number of sensations of light, sounds, etc., ere the infant consciously sees or hears. . . . The brain stores up according to an orderly system the totality of our experience, and the results of our thinking; . . . the brain, by methods all its own, turns to account the matter given it, and renders interest in the way of well-remembered experience and carefully formed opinions. Let, at any moment, the right-suggesting string be pulled, and any desired fact of knowledge or past experience flashes into consciousness. . . . The real mind, the true self-conscious, thinking ego is buried deep within the recesses of the brain. The sum total of our experience and past thinking constitutes the real ego, which, for convenience' sake, we denominate the real ego. Each one of us, therefore, possesses a consciousness within a consciousness—a self within the self, wherein is found the organized experience of life subject to memory's call. And it is not until these subconscious depths be touched that our real opinions are revealed; that the soul melts with compassion, or is moved to acts of mercy. . . . The true life of the ego is centered here, and hence conduct and character reflect this inner life. For the motives which prompt to action are inspired by the thoughts and emotions which dominate the soul. We act as we think. Here, then, are the hidden springs of conduct, the motive forces of the character. . . . The organized experience of every individual is arranged in groups. A certain group of brain-cells responds to stimuli of a given kind, another group to impressions of another kind, and so on. . . . The nervous irritation which a stimulus incites in a group of cells is communicated by the law of association to other associated groups, . . . and it is through the law of association that some object or idea will call into the field of consciousness a long train of associated ideas. . . . An overwhelming per cent. of mind activity is due wholly to the law of association. In other words it is suggested thought, and hence very largely unconscious thinking—thinking which is not under the control of the will. . . . It may, therefore, be succinctly stated that all thought not under the control of the will is suggested thought—thought due to the law of association. And any object in the environment (that is, any sense stimulus), or any idea derived from external sources, is sufficient to set in action a train of associated ideas. . . . It may be assumed that

thoughts thus suggested at random do not reach the subconscious self, and hence gain no power over the mind. . . . As all force follows the line of least resistance, a given line of thought tends to repeat itself. . . . Two or three repetitions of the same train of thought and a channel or thought track has been cut into the brain, a thought habit is formed, and the train tends constantly to repeat itself upon slighter and slighter suggestion. . . . Thus the loss of money may suggest to a man depressed by misfortune the steps by which he is to reach the poorhouse, but the daily recurrence of this idea may send him to the madhouse. . . . The normal mind has the power to turn in upon itself; that is, by an act of *attention*, one may become conscious of what is passing in his mind; and this act of attention is an act of the will. By means of this will we may control our thinking. By determined effort we may concentrate the mind upon a selected idea, holding it steadily in consciousness, until, by slow, imperceptible degrees, it makes for itself a lodging place, becomes a constituent part of our mental life, and thus is co-ordinated or organized. . . . We have just examined the unconscious suggestion, and recognized its danger and its power. Yet it is to the conscious, voluntary suggestion that we may turn for our mental, moral, and physical salvation.

Auto-suggestion may be briefly defined as a voluntary, self-initiated idea. It is an idea presented to the mind by an act of will. And I hold, that by means of such self-initiated ideas both mind and body may be profoundly influenced, the moral nature regenerated, and a noble character evolved."

SOCIETY MEETINGS.

MEETING OF THE CLINICAL SOCIETY OF THE NEW YORK SCHOOL OF PHYSICAL THERAPEUTICS.

Stated meeting, January 19, 1904, Herman Grad, M. D., in the chair. Paper by Dr. Russell H. Boggs, of Pittsburg, on *Methods Used in Radiography*. Discussion:

Dr. E. W. Caldwell: I wish to compliment Dr. Boggs on his paper, but know of no suggestions to make.

Dr. A. Holding: The quick method of taking skiagraphs is developing rapidly in this country, particularly during the past year. It means co-operation in all its processes. I use a coil of good size and a Weynault interrupter. The same results obtained from several workers at the same time gives more evidence that it is necessary to use low-vacuum tubes to do the penetrating work as they give more detail. There are several methods in vogue:

(1) The Germans use blends (compression blends).

(2) A very simple method such as the doctor has shown, which is worthy of consideration. Screens have been thought to be useful, but Dr. Boggs has demonstrated that they are not necessary, as it is possible to use short exposures by skillful manipulation of the apparatus. Under such men as Dr. Boggs even better results will be obtained.

Dr. Branth: I must compliment Dr. Boggs on the superiority of his paper. The photograph is more reliable than a fluoroscopic examination. (He then exhibited some skiagraphs.)

(1) Containing comminuted fracture of the radius.

(2) An arm showing cartilaginous joint. "It will give you an opportunity to look into nature's laboratory and see nature's handiwork, false though it is."

(3) A fractured patella.

(4) A radiograph of the skull of a young man, which demonstrated that the rays pass through the brain, as well as they are of value in diagnosing fractures and setting bones.

(5) A skiagraph of both hip joints. The X-rays are not used often enough in diagnosing. Dr. Weigel has shown that tubercular bones could be skiagraphed demonstrating the tubercular end, which is important surgically.

(6) Hand of Egyptian mummy. (7) A skiagraph of a six-months' fetus. (8) A foot in a shoe, showing details. I used an ordinary developing method, employing pyrogallie acid, sulphide of soda, carbonate of soda, and water.

Dr. William Benham Snow: It seems to me that Dr. Boggs and Dr. Branth have shown work of two distinct types—the difficult and easy problems. Bones and joints are easily skiagraphed by any apparatus, but the difficult task of fine discrimination calls for methods of great skill and coils and tubes of superior construction. I am sure, two years ago, we would have been astonished at the short time necessary to take a skiagraph of a hip joint or calculus in the kidney. I am speaking now of the progress in respect to the more difficult diagnosis. We used to use crude apparatus and high vacuum tubes, with the result that nothing but the bony structures could be shown, but now, in the hands of men of great skill and technique, we better understand the application of the rays to detail work. Dr. Boggs has shown us *pus* cavities, *fæces*, etc. I thank Dr. Boggs for his valuable paper.

Dr. Herman Grad: The amount of work done by the author, and the many facts pointed out, with the fine details in this paper, is a revelation to me. One must understand his tube and his apparatus to do efficient radiography. The doctor says he can tell the condition of the tube by the sound, showing his great familiarity with his apparatus. Radiography has increased the field of diagnosis. By this means the differential diagnosis between tuberculosis, syphilis, and malignant diseases of bone becomes comparatively easy. It is of great help

in diagnosing tubercular hip joint, and osteomyelitis. Formerly the surgeon chiseled away, inch after inch of bone to reach the foci of disease. Now we can locate at once these foci by means of the skiagraph; the skiagraph also shows to what extent the bone is involved, and where to operate. We can utilize the rays in the diagnosis of calculi, and I am glad to hear that the doctor was able to report that he had located them in five cases. Skiagraphy is of great importance in chest diseases, as in gangrene of the lung, where physical signs alone are not sufficient to make a diagnosis.

Dr. Boggs exhibited a beautiful collection of skiagraphs.

The second paper read was by Dr. Samuel C. Tracey, on "Practical Experience in Use of Radium."

Discussion.

Dr. Charles W. Allen: I beg to thank the doctor. We know very little about the subject of radium; he probably knows as much about it as anybody, and the process must be slow and tedious in its nature. While I am speaking, I think in respect to lupus erythematosus, we have better results with the use of high-frequency than by any other method. I do not think I will try to use radium in lupus, unless it be in lupus vulgaris. By one man working in one direction and another in another direction, we arrive at a perfection of apparatus and a perfection of technique. I am very much interested in Dr. Tracey's paper. How long is the radium used to get three dops so as to localize treatment?

Dr. W. B. Snow: There is something that interests all in these measures. The prophecies of the past are being fulfilled. I have been watching the action of radium in several cases. In one I saw a very violent reaction produced after five minute exposures, but it was probably due to a weakened resistance induced by the X-ray, as it had become extremely susceptible from previous extensive employment. The action of radium is probably like the X-rays, as it has been demonstrated that the rays are analogous to the X-rays. We are finding more and more its particular use. Give radium a good trial; it is hoped that others can get definite details such as Dr. Tracey has given us. I wish to ask the doctor if salt solutions rendered radioactive do not become inert when taken into the stomach by forming compounds which destroy this fluorescence? I thank Dr. Tracey very much for his excellent paper.

Dr. Brinkmann: Where we require a considerable number of exposures of the X-ray cannot radium be used to help the breaking down? In respect to the question of fluids containing radioactive rays, when introduced into the stomach containing hydrochloric acid they must replace the bromide base. Another point experience has shown internal malignant conditions are difficult to tamper with, so I am skeptical as to the

uses of radium internally, from both a physical and chemical basis. I personally thank the doctor for his paper.

Dr. Grad: I thank the doctor for spending so much time and money on experimental work. I started to give five minute exposures with my radium, which is not a pure specimen, it is only 30,000 radio-activity. The first case was an epithelioma of the anus. I first treated the case with the X-ray using a Caldwell tube, the patient complained of great pain, I first gave a ten minute exposure on the buttock and six or seven directly over the affected parts. Raying would relieve the pain for hours; but five minutes of radium treatment would relieve him for a much longer time, say forty-eight hours. Now I give him twenty minute exposures and the patient has had no pain, and the epithelioma is smaller. The next case treated was an epithelioma of the tongue, diagnosed microscopically. One cervical gland was enlarged in the sub-maxillary region. After six exposures, for ten or fifteen minutes, improvement was noticed. He was first treated three times a week, now twice a week. I am now trying radium on a sarcoma of the cervix but I do not know what the results will be. I was much interested to learn that Dr. Tracey treats his cases daily. In a case of psoriasis I use radium over certain spots and X-ray the patient at the same time. I could see no difference when the radium was used alone or in combination with the X-rays. I have tried the so-called radioactive solution, but cannot report any results.

Dr. Brinkmann: Have you given it internally?

Dr. Grad: I have not been so bold.

Dr. Tracey: In order to make the radioactive solution I expose one pint of salt solution forty-eight hours to radium bromide. Pictures can be taken by means of this solution. I treated a case of epithelioma of the mouth every day for six weeks with radium but it had no effect. A long time is necessary in treating a case of lupus. In giving radioactive solution internally I give a teaspoonful dose. In the eye I put in three drops. Dr. Snow's patient probably had an idiosyncrasy. Radium does not seem to affect good tissues. I have never used X-rays and radium at the same time. Radium is certainly a good pain reliever.

Dr. Cole of New York then exhibited a collection of reduced photographic plates taken from skiagraphs. The negatives naturally reverse the light and dark shadows of the skiagraph and the reduction also causes the detail definition to become more distinct. The collection from the point of excellence was exceptionally good including several of kidney stone and other usually conditions.

BOOK REVIEWS.

A CHART OF STATIC MODALITIES. By F. HOWARD HUMPHRIES, M. D. (Brux.), F. R. C. P. (Edinburgh), M. R. C. S. (England), L. R. C. P. (London), Hon. Consulting Physician Queen's Hospital, Honolulu, T. H. U. S. Issued by the Hospital Supply Co. Price, 25c., net.

This chart places in graphic form the various static modalities the methods of application, physiological actions and therapeutic indications.

The arrangement is ingenious and accurate, and when framed and placed in the static operating room will prove a great assistance to students and beginners who are not familiar with static technique.

The author deserves credit for the accuracy and convenient style in which he has executed the work.

The chart is about 20x22 inches in size and printed on parchment paper.

FISCHER—INFANT-FEEDING IN ITS RELATION TO HEALTH AND DISEASE. A modern book on all methods of feeding. For students, practitioners, and nurses. By LOUIS FISCHER, M. D., Visiting Physician to the Willard Parker and Riverside Hospitals, of New York City; Attending Physician to the Children's Service of the New York German Poliklinik; former Instructor in Diseases of Children at the New York Post-Graduate Medical School and Hospital; Fellow of the New York Academy of Medicine, etc. Third edition, thoroughly revised and largely rewritten. Containing 54 illustrations, with 24 charts and tables, mostly original. 357 pages, 5 $\frac{3}{4}$ x 8 $\frac{3}{4}$ inches. Neatly bound in extra cloth. Price, \$2.00, net. F. A. Davis Company, Publishers, 1914-16 Cherry Street, Philadelphia, Pa.

This work which was originally written after ten years' experience by the author in the treatment of children's diseases in one of the largest clinics of this country, has been through two editions, the second edition of which has been exhausted since September, 1901. The author has omitted the greater part of the chapter on Gaertner's Milk because the milk is not distributed fresh daily, which he considers a matter of vital importance. Another new chapter has also been written on Buttermilk Feeding, treating of the method in vogue in the Foundling Asylum, and the Dietary for Older Children has been enlarged; the method for Feeding in Diphtheria has been rewritten. A new chapter has also been written on the Feeding of Children Afflicted with Cleft Palate and a great deal has also been added to the chapter on Modified Milk from the Walker, Gordon Laboratory—much of what had previously been written on this subject has been left out. Some illustrations have also been added showing specimens of poor breast milk.

The writer's reputation and the popularity of the former editions of this work are an assurance that it will be well re-

ceived. The work is well illustrated and thoroughly covers the subject treated. It is a volume upon a subject in which every general practitioner should be well informed.

A SYSTEM OF PHYSIOLOGIC THERAPEUTICS, in eleven octavo volumes: **A Practical Exposition of the Methods, other than Drug-giving, useful for the Prevention of Disease and in the Treatment of the Sick.** Edited by **SOLOMON SOLIS COHEN, A. M., M. D.**, Senior Assistant Professor of Clinical Medicine in Jefferson Medical College, Physician in Jefferson Medical College Hospital, etc. Vol. 7. **MECHANO-THERAPY AND PHYSICAL EDUCATION**, Including Massage and Exercises. By **JOHN K. MITCHELL, M. D.**, Fellow of the College of Physicians of Philadelphia; Physician at the Philadelphia Orthopedic Hospital and Infirmary for Nervous Diseases; Assistant Neurologist to the Presbyterian Hospital of Philadelphia, etc., and Physical Education of Muscular Exercises, by **LUTHER HALSEY GULICK, M. D.**, Director of Physical Training in the public schools of Greater New York; President of the American Physical Education Association; Chairman of Physical Training Committee, Louisiana Purchase Exposition; Chairman of the New York Basket-Ball Committee, etc., with special chapters on Orthopedic Apparatus, by **JAMES K. YOUNG, M. D.**; on Corrective Manipulations and Orthopedic Surgery (including "Lorenz Method") by **AUGUSTUS WILSON, M. D.**, and on Physical Methods in Ophthalmic Therapeutics, by **WALTER L. PVLE, M. D.**, with 229 illustrations. Published by P. Blakiston's Son & Co., 1012 Walnut St., Philadelphia, Pa. Price, \$28.50, net, for set.

This work deals in each department in a practical manner with the subjects which the authors have considered. The subjects of Physical Exercises, Massage, and Corrected Mechanical Methods, occupies a first place in therapeutics, prophylactic and corrective. The scientific manner in which the writers have treated their respective subjects will be found profitable by both general practitioners and specialists. The work is profusely illustrated with excellent half-tone plates, illustrating methods of treatment and exercise which are of much importance in a work of this kind. It is only to be regretted that more attention has not been given to the employment of vibratory apparatus which are now meeting so well many indications for the treatment of deformities and the relief of other physical conditions. The work as a whole, is a credit to editor, authors, and publishers.

HANDBOOK OF PARLIAMENTARY USAGE. By **FRANK WM. HOWE.** Arranged for the instant use of Legislative and Mass Meetings, Clubs and Fraternal Orders, Teachers, Students, Workingmen, and all who desire to conduct themselves "decently and in order" in public assemblies. Hinds & Noble, publishers, 35 W. 15th St., New York City. Price 50c., postpaid.

This is the most unique work of the kind that has been published.

Opening the book in the center, before the eyes of the reviewer appear the subject headings covering the subjects ruling deliberative bodies, making it convenient to turn instantly to the rules governing any question which may arise. The book is of a convenient form to have in the pocket, and

will serve as a very ready handbook of reference. The rules as given are after the standard authorities, Cushing, Robert, Reed, and Palmer. We cordially commend it to those who desire such a manual for reference.

CLINICAL TREATISES ON THE PATHOLOGY AND THERAPY OF DISORDERS OF METABOLISM AND NUTRITION. PART II. NEPHRITIS. By PROFESSOR CARL VON NOORDEN, Physician in Chief of the City Hospital, Frankfort a./M. Authorized American edition, translated under the direction of BOARDMAN REED, M. D., Professor of Diseases of the Gastro-Intestinal Tract, Hygiene and Climatology, Department of Medicine, Temple College; Physician to the Samaritan Hospital, Philadelphia, etc. Published by E. B. Treat & Company, New York, 1903. Price, \$1, net.

The second volume of this valuable series is full of practical suggestions, and is written in the characteristic style of the writer, who is possessed of a large clinical experience, and prepared to make observations which many times seem to be radical. Dr. von Noorden has much to say concerning the relation of diet and metabolism, employing a very limited drug therapy in the treatment of nephritis. He pays particular attention to two types of kidney trouble, acute nephritis and contracted kidney, and lays stress upon the value of a milk diet in the treatment of nephritis.

The work is invaluable to the general practitioner, and in pace with rational therapeutics.

NEW AND IMPROVED APPARATUS.

This department is devoted to publishing, with illustrations, drawings, and descriptions, new apparatus, electrodes, etc., for the benefit of those interested in the progressive improvements in armamentaria.

THE STRONG STATIC INDUCTION AND HIGH FREQUENCY APPARATUS.

This is an appliance for the generation of high frequency currents, based on the Tesla principle. It is attachable directly to the incandescent electric lighting circuit and uses from 1-8 to 1-2 horse power of electrical energy, which is transformed in a very efficient manner to a potential of upwards of a million volts and a frequency of from two or three million, up to several billion oscillations per second. Although as previously stated this apparatus is of the high frequency type, owing to very perfect conditions of balancing and resonance it has been found possible to obtain practically all static effects. Being entirely independent of atmospheric conditions and having no

moving parts of glass or other fragile material it will be readily apprehended that it literally fills a long felt want.

The high frequency effects obtainable with this apparatus transcend those of any other apparatus heretofore produced for the therapeutic application of high frequency currents. The possibility of harmful effects, it is believed, have been entirely eliminated in this apparatus, as it is possible for a person



High Frequency Apparatus.

to take the full output of the machine directly across the terminals without any apparent ill effects or unpleasant sensation.

The static spray or breeze obtainable is regarded by many of those who are using the apparatus to be much superior to that ordinarily produced by a static machine. This is largely owing to the fact that the breeze transmits vastly more energy than the common static breeze and at the same time there is less tendency to spark.

In addition to high frequency and static effects excellent X-ray effects are obtainable and by means of a specially designed attachment, very powerful ultra-violet rays can be generated for use in any case in which the Finsen light is supposed to be of value.

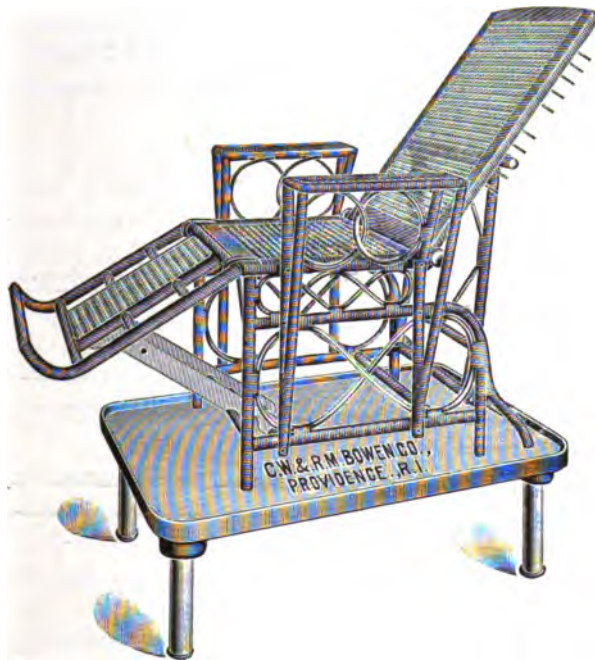
As Dr. Strong's article in another part of the JOURNAL deals

quite fully with the technical construction of the apparatus it is not considered necessary to enter into that in this description.

BOWEN'S PERFECTION CHAIR.

This chair has been constructed to fill the demand of the many users of static electricity, and is the outcome of a year's experimenting, to bring it to its present state of perfection.

It is small enough to be used on the regular static platform and at the same time large and roomy enough to accommodate



heavy patients. The back can be raised and lowered, giving the patient full support either in an upright or recumbent position and at any point between. When extended it makes a perfect couch or table, thus giving the patient the benefit of treatment which in many cases it is impossible to otherwise obtain. The leg rest is made with openings on the sides, making perfect stirrups which will be found very desirable in giving certain treatments.

The chair is very substantially made of bent wood and rattan so as to avoid attracting the current to any one place.

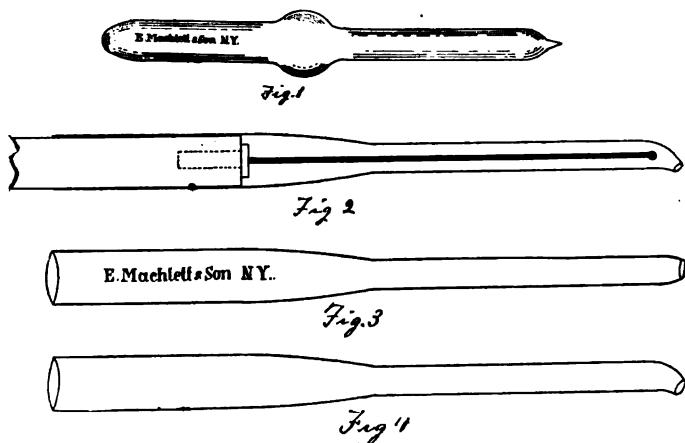
When not in use for electro-therapeutic work, it makes a most comfortable and handsome reclining and office chair, and is much better adapted for gynecological and other examinations than some of the chairs now sold for this purpose.

Price, carefully crated, f. o. b. Providence, \$28.00.

NEW GLASS ELECTRODES AND HIGH FREQUENCY ATTACHMENTS.

Figure 1 represents a new glass metal electrode designed by Dr. Arnold Snow for the treatment of hemorrhoids.

Figures 2, 3, and 4 show a new form glass localizing sleeve, designed by the Editor, to be placed over the static wooden



New Glass Electrodes and High-Frequency Electrodes.

Fig. 1. Rectal vacuum electrode.

Fig. 2. Glass sleeves brush discharge electrode in position.

Figs. 3 and 4. Glass sleeves for special applications.

brush-discharge electrode having the terminal, ending in a brass ball, in position, as shown in Figure 2. The sleeve fits loosely over the stick and is long enough to permit moving it to and fro, enabling the operator to localize a mild or strong discharge.

The distal ends, as shown in Figures 3 and 4, may be made with openings of different sizes and turned in different ways for making application to fauces, middle ear, vagina, or rectum.

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No. 5.

THE USE OF THE CONTINUOUS CURRENT IN THE TREATMENT OF CANCER AND KINDRED DIS- EASES.*

BY WILLIAM WINSLOW EATON, A. M., M. D., DANVERS, MASS.

Somewhat imperfect vital statistics indicate that more than 50,000 persons die of cancer yearly in the United States.

Tuberculosis and zymotic diseases are amenable to preventive measures, and diminish with improved hygiene and treatment.

There is no known prophylaxis for cancer, no bulwark against its deadly assault. It invades by preference the homes of luxury and refinement, fastens upon the temperate and virtuous, the scholar and statesman, the man of mature years, the mother and maiden alike. Climate, contagion, filth and want are not causative factors, nor is heredity an essential one. Its increasing prevalence, the frightful nature of the disease in all its forms,—the almost certainly fatal termination,—the complete inefficiency of internal medication,—the unsatisfactory results of surgical operations, even in what are considered favorable cases are generally acknowledged.

The British Medical Journal states that the death rate from cancer has doubled in twenty-five years.

In Germany an average of less than 25 per cent. of cases of cancer are found to be operable and of these less than one-tenth are saved. Dr. Reyburn reports Dr. Baldy of Philadelphia as saying of the hospital results that only five per cent. of patients operated upon for cancer of the cervix uteri are cured; that records at the Johns Hopkins Hospital give the same result; that Professor W. A. Freund was able to report only two permanent cures in twenty-three years and that Dr. Roswell Park estimates that in six years more that the death

* Read at the Thirteenth Annual Meeting of the American Electro-Therapeutic Association, at Atlantic City, September 23, 1903.

rate from cancer will exceed that of consumption, smallpox, and typhoid fever combined, if the present rate of increase continues.

These facts have caused cancer to be the most dreaded of diseases, have stimulated investigation by the ablest minds, and should lead to the employment of any reasonable therapeutic means tending to prolong life, relieve pain and restore to even temporary health and strength.

Full merit is accorded to whatever harvest of good that has been reaped from the erysipelas toxin, animal extracts or Alexander process.

The public is deeply interested in, and scientists are hopefully testing the unknown powers of radium and allied metals.

The inhibitory action of the Finsen light and Roentgen rays upon malignant growths and their therapeutic and curative effects in cases of lupus, epithelioma and surface cancers, have been fully demonstrated; their successful application to deep seated, malignant disease is still on trial with encouraging results.

The proved necessity for the absolute extirpation of all diseased cells in operations for cancer; the invariably evil effects of curettement or the partial removal by the knife, as shown by the frequent early recurrence of the disease, metastasis and fatal results, justified the radical removal attained by the use of liquid air, the electric and thermo-cautery, the arsenic and zinc paste, or the chemical energy of the electric current in mercuric cataphoresis so brilliantly devised and applied by Dr. Massey.

Safe and effective as these latter methods may be, there will still be found in private practice, at least, many cases in which they would be accepted only as a *dernier ressort*, owing to the severity of the operation, the opposition of patient or friends, the lack of proper apparatus and skilled technique of the surgeon, and the injurious and unfavorable criticism that would follow any untoward result.

There remains an electric force, with which you are all familiar, whose remedial effects as brought out by Apostolli have won for him imperishable fame and the undying gratitude of thousands of suffering women whose burdens have been removed and lives preserved.

The constant galvanic current, or, as now preferred, the continuous current, unequaled by any known force as an agent

for the safe reduction of uterine fibroids and other non-malignant neoplasms, has also a potent power and efficacy in promoting the absorption and removal of cancer either superficial or deep-seated. With proper care always beneficial, never harmful, ready to the hand of every electro-therapeutist, welcomed by the alarmed patient with hope and trust, at that period of vital importance, the early stage of the disease, the continuous current with its chemical, electrolytic effect is of the highest importance and while it cannot supersede the X-ray should accompany it *pari passu*, each rendering the other more effective.

In the early cases of cancer, of which a report is here given, the continuous current was used alone; during the past two years the X-ray has also been applied in each case, the power being derived from a 12-plate Van Houten influence machine.

For the continuous current a 40-cell Waite & Bartlett battery has given satisfactory strength. The electrodes have been of various sizes, forms and material, the indifferent one preferably of clay.

The strength of current has been from 75 to 175 ma.; the duration of each séance about fifteen minutes, the full strength being gradually attained in 2 to 3 minutes.

The cases selected for this report are typical of the severer forms, some inoperable, and others having treatment after failure of operation or upon recurrence.

Case No. 1.—Mrs. R., age fifty-one, married, five children, youngest twelve years old; first seen in July, 1895. Menses ceased at fifty. During past year occasional attacks of abdominal pain with leucorrhœal discharge, sometimes bloody and recently of foul odor. Several relatives have died of cancer.

On examination found a hard nodulated growth involving cervix and lower portions of uterus, no vaginal lesion; uterine secretion bloody, with offensive odor; diagnosis, carcinoma.

Treatment; bi-weekly applications of continuous current six weeks, then once a week for two months; growth diminished one-half, discharge ceased, pain entirely relieved.

General health remained good, was able to attend to household duties for three years, then had a slight return of former symptoms. Examination showed inflammatory condition at

original site, foul uterine secretion, indicating recurrence of disease. Under constant current again at intervals of three days to two weeks for several months with marked improvement.

Health and strength continued nearly normal till spring of 1901 (three years more), then patient began to have what she called rheumatism of the back and legs; also much oedema of left leg. July 10th, discovered a small, hard, tender swelling in the left groin. This increased rapidly in size and with so much pain that she came to the office, August 17. The glandular enlargement was dark and very sensitive, measured 4×2 3-4 inches. The sanguineous, offensive discharge had appeared again. With little hope of any beneficial effect, but by desire of the patient, the continuous current was applied and repeated every second or third day for two weeks, causing a reduction of the glandular enlargement to 3 1-2 \times 2 inches. Also considerable improvement which, however, was only temporary, and as she became too weak to come to the office, electrical treatment was abandoned. Opiates were given to relieve pain, and she died January 12, 1902, more than seven years from first appearance of cancer, six of which had been passed in fairly good health.

Case No. 2.—Mrs. G., age forty-six, married. Three children, youngest seven years old. Seen December 5, 1896. Family history good. Menses regular till two years ago, followed by slight show two or three times, then began to notice increase in quantity and frequency, with rather severe cramping pain. Two months ago a severe hemorrhage followed by slight daily offensive discharge. Consulted a physician, who diagnosed uterine cancer. A week ago had another hemorrhage, with pain, large clots and bad odor.

Examination showed carcinomatous growth involving cervix uteri, posterior vaginal vault, and posterior half of uterus; mucous surface inflamed, ulcerated, uterine secretion profuse, semi-purulent, and bloody.

Applied continuous current, 100 ma., positive, internally copper electrode covered with moistened absorbent cotton in vaginal cul de sac, three times in eight days. All hemorrhage controlled, then negative pole internally twice a week for two months. So much improved that interval was extended to two and three weeks. No application after middle of June

till October; then on account of slight return of discharge and pain, current applied eight times at intervals of four days to three weeks.

Patient has had no recurrence of disease and is able to attend to her usual household duties to the present time, six years.

Case 3.—Mrs. H., age forty-five, married, four children, youngest fourteen; sister of case No. 1.

Seen in spring of 1897; had been under treatment for cancer of uterus for a year by local physician in consultation with two skilled city physicians. No operation deemed advisable—prognosis of fatal termination within a year.

Condition—emaciated, cachectic, weak, frequent hemorrhages, severe abdominal pains, difficult urination, and constipation; vaginal passage nearly closed by epithelioma, which also invades bladder and body of uterus.

Treated at her home for three months, twice a week, by galvanic current from portable battery, from 50 to 125 ma. After third application, condition slowly improved. Had three or four slight relapses, but continued to gain slowly. Applications were made at irregular intervals through the winter, and in the spring she was sufficiently improved to come to the office for treatment and to do light work about the house. All unfavorable symptoms lessened. She was able to sleep and eat well, but all treatment was not discontinued till end of third year—the spring of 1900—since which time there has been no apparent necessity for electrical applications, as she remains in a comfortable condition, although not in perfect health.

Case 4.—Sarcoma of breast. Mrs. G., age fifty-five, married, no children. Seen first of June, 1899. Tumor in left breast 2x3 inches, of irregular outline, sensitive, nipple retracted, skin discolored, shooting pains. Continuous current twice a week for two months. Positive electrode 7x9 inches to back, negative 3x4 over growth, 50 to 75 ma., each sitting, 15 to 20 minutes. Total disappearance of neoplasm. Remained well till May, 1903, then pain and slight hardness in pubic region. Came to office June 30. Uterus double normal size, with hardness, irregular outline, anterior, slight brownish discharge from os. Treated weekly through July and August. Much improved, no pain, size of uterus reduced more than one-half. Says she feels well.

Case 5.—Also cancer of breast. Mrs. J., age forty-six, married, no children. First seen September 20, 1900. Gave history of small, hard, painful growth in right breast in 1896. Treated by family physician till 1898. After consultation, removal of breast advised and performed, December 26. Good recovery, but the following March began to have darting pains and soreness along line of cicatrix, nodules at various points and enlargement of axillary glands. Second operation performed June 22, 1899. All hardened points, muscular tissue and diseased glands removed. Repair and recovery tedious. Ten months later nodules began to appear at various points in right side and one in lower border of left breast. These began to be tender and painful and increase in size and number; when seen in September the two largest were 1 inch and three-quarters of an inch in diameter, with raw surfaces. Constant current in strength 40 to 80 ma. applied twice a week till November, then weekly till January, and once a month till May, 1901, when all traces of hardness, soreness and glandular enlargement were dissipated. Was seen at her home in November, 1902; there had been no recurrence of the disease, but she was suffering from rheumatism, with weak and irregular heart action. Received notice of her death January 12, 1903.

Case 6.—Cancer of rectum. Mr. A. M., age thirty-six, shoemaker, married, four children, one to six years of age.

Began to have loose dejections about Christmas time, 1898, with occasional tinge of blood. Thought it was a hemorrhoidal trouble. Passages gradually became more frequent, with mucus and blood, also slight pain. First consulted me July 15, 1899; had begun to lose flesh; movements three to six times daily, slimy, muco-purulent, bloody, pain not severe.

On examination found a hard, irregular, lobulated mass nearly encircling rectum, four inches above anal opening and apparently extending upward one and a half inches to two inches, though finger could not pass through the constriction. Advised palliative measures, and a month later had him examined by Dr. Kittredge of Salem. No operation was deemed advisable, and the prognosis was that the case would terminate fatally within a year. All unfavorable conditions increased gradually and the 10th of October, 1899, he decided to try electricity, and an application of 30 ma. carbon elec-

trode per rectum was made and repeated weekly for three months, with marked improvement in general health and diminution of foul discharge and pain. The strength of current was increased to 40 to 50 ma. with increased size of electrode and a corresponding enlargement of the lumen of bowel. His strength and appetite improved and he was able to continue his daily work. Applications were made on an average of twice a month during the year and occasionally in 1901. No unfavorable symptoms supervened till last spring, when the alvine discharges became more frequent, purulent and offensive, with increased pain and weakness. The continuous current was used bi-weekly, supplemented by 10 to 15 minutes' exposure to X-ray, with considerable benefit, so that he still held his place in the shoe shop.

He has received no treatment the past two months, has given up any active work and is depending upon opiates to relieve pain.

Is it unfair to claim that the electrical treatment has preserved for nearly four years with such a degree of health and strength a life so dear and valuable to the loving wife and dependent children?

Case 7.—Mrs. H. V., age sixty-nine, first seen October 31, 1901, shortly after her discharge from Boston Homeopathic Hospital, where she had a very deep curettement for cancer of vaginal vault and uterus.

History of case was menses ceased at forty-nine; well till two years and a half ago, then a troublesome leucorrhœa, followed on March 1, 1901, by a severe hemorrhage. On March 10 operation for removal of malignant growth by knife, affording temporary relief. On September 3 another profuse hemorrhage, followed by lighter ones till October 24, when she went to hospital for the curetting. The surgeons informed the daughter that nothing further was possible, that the disease was fatal and the end was probable in from 2 to 3 months.

Examination showed removal of cervix and lower third of uterus by operation or disease. The vaginal walls and all surrounding tissues a mass of malignant deposit, the discharge sanguineous and of the most offensive odor.

The constant current was applied with positive zinc electrode internally in direct contact with the diseased tissues, and repeated every three days for seven weeks, by which hemorrhage

was controlled, discharge lessened and odor less offensive; also marked improvement in general condition. December 23, after a long walk, had another profuse hemorrhage and was too weak to come to office. Was treated at her home December 25 and every second day till January 5, after which there was no return of hemorrhage. The middle of January, 1902, she came to board near my office, and had applications made twice a week. Was so benefited that she was able to walk, ride or do any work she wished to during the entire year.

In February, 1903, her daughter had rheumatic fever and she went home to superintend affairs. Took cold, had an attack of la grippe and died March 12, 1903.

Case 8.—Mr. Mc., age forty-five, came to me April 24, 1903, from Massachusetts General Hospital, with advanced and inoperable cancer of stomach. Condition one of great emaciation and weakness, unable to take or retain any food; frequent eructations of a glairy, brownish, offensive fluid, almost constant pain and nausea. Weight 109; has lost 30 lbs. past month. Cancer growth seen and felt externally. Location, cardiac orifice of stomach, 6 1-2 inches transverse measure and extends 1 inch below umbilicus.

Treated with constant current, large clay electrode over growth and in dorsal region, strength 150 to 175 ma., also 10 minutes of X-ray.

Improvement in every line manifest the first week and continued till July, when he returned home; was able to eat, retain and digest food and had gained 4 pounds in weight. The tumor diminished in all directions and was less sensitive. He has returned occasionally for treatment but does not gain as when the séances were more frequent.

These cases have been selected as illustrating largely the most severe forms of cancer, internal and inoperable, at an unfavorable age, and in part covering a length of time that adds immensely to the value of the results obtained.

In review it will be found that of the eight cases five are living, one at one year, one at four, one at six and two at seven. One died of metastasis of original disease and glandular infection, after more than six years of comparative health. Two died of other diseases after an improved condition of one and a half to two and a half years, though it is probable the malignant disease was contributory. A sum-

mary of forty cases of malignant disease of stomach, breast, liver, rectum and uterus treated by the constant galvanic current the past seven years, shows an improved condition in general health, relief of pain, reduction in growth and control of hemorrhage in every case, 100 per cent.

In ability of patient to continue work and remain self-supporting, 25 cases, or 62 1-2 per cent.

Of deaths from contributory cases, seven, 17 1-2 per cent.

Of deaths directly due to cancer, seven, 17 1-2 per cent.

In closing the writer will only add that it is his earnest conviction that every case of malignant disease should have the harmless, powerful modality of electricity as obtained by the proper application of the continuous current, also that this force should be reinforced and aided by the X-ray or whatever other agent shall be proved efficacious.

The field is a broad one—there are honors and rewards to every honest, earnest worker in the divine mission of combating disease, relieving suffering and saving human life.

Discussion.

Dr. Boardman Reed asked whether if in the case of cancer of the stomach reported, in which 150 milliamperes of current were employed, the treatment caused pain and burning.

Dr. W. B. Snow wished the author would describe more specifically his method of applying the continuous current. The paper was very interesting, and the results remarkable.

Dr. Massey expressed his obligations to Dr. Eaton for this paper, and his interest in the excellent results obtained. It should not be forgotten, he said, that amelioration was important as well as cure. However, he was disposed to believe that some of the work could have been still better done by the electric diffusion of mercury or some other metal without any great deviation from the conditions prescribed by the author, *i. e.*, the treatment of the case without incurring undue risk, such as might result from massive cataphoresis under ether anæsthesia. This calling into play the chemical action seemed to the speaker a very important point. Some years ago a great deal had been said upon this subject by Inglis Parsons, of London, who used massive currents under general anæsthesia. Dr. Massey said he was convinced that in some cases of supposed cancer of the breast the use of the simple continuous current had been followed by an increased growth, due no doubt to increased nutrition of the part. It should not be forgotten that we had as many forms of cancer as there were

cases presenting themselves for treatment. For instance, a group of cases, though classed as epitheliomata, might vary as greatly as the solanums, which include the potato and the tomato, on the one hand, and the deadly nightshade, on the other. The statistics of the mercuric treatment, as carried out by himself, would shortly be published. There were over sixty of these cases, of which nine were sarcoma and the remainder carcinomata. Of the former, only two were living; several of the others died from causes more or less directly connected with the operation. Of the carcinomata, there were eighteen successes, so that in this series there were twenty patients who were well after the expiration of a period varying from three to seven years.

Dr. A. D. Rockwell congratulated the author upon his successes, though expressing his belief that this question of the influence of the continuous current alone upon cancerous growths must be considered as *sub judice*. He said this because about twenty-five years ago he had made very exhaustive experiments with electrolysis on cancerous growths. One of the early cases was a cancerous breast in Bellevue Hospital. There resulted a very considerable disappearance of the tumor, but the patient died one month afterward with a cancerous affection of the liver, apparently a metastasis. This, he thought, we sometimes had to fear. In his experiments on cancer of the breast he had made use of needles, but had been unsuccessful, as a rule, in reducing the growth, although the pain was relieved. He had then in conjunction with the late Dr. Beard, made use of an experiment which they termed "working up the base." After the breast had been removed by surgical operation, this was done, and it set up an intense reaction which caused destruction of the underlying tissues. This method had been tried in about half a dozen cases, but not one of them was cured, the disease either recurring in the old site or appearing at some new point. For these reasons he had not attempted the use of the continuous current for many years in the treatment of these deeply seated cases of cancer. In the cases reported in the paper it was probable that the good results were largely dependent upon the use of the X-ray. A still better result should follow from the employment of Dr. Massey's method of mercuric cataphoresis.

Dr. Robert Reyburn said he did not think cancer was a germ disease. In the first place, it was unilateral as a rule. Gaylord, of Buffalo, claimed that he had discovered the germ of cancer, but apparently this claim had been disproved. In the Journal of the Society for Medical Research, of Boston, this question had been elaborately considered, and the conclusion reached that there were no germs in true cancer. The cause of cancer was a very important thing to know because it bore directly upon the treatment. Dr. Lombard, of England, had

caused cancerous tumors by the injection of healthy epithelium into the abdomens of animals, seemingly showing that nothing more was necessary to cause cancer than irritation, provided that other conditions were favorable. It should be remembered that the vast majority of cases occurred about the time of the menopause. Aging of the tissues, it must be remembered, was a relative term, and he was inclined to look upon cancer as a retrograde metamorphosis. Cancer was apt to occur in persons having some inherited vice of constitution. After a case had been cured by the X-ray one still had to fear recurrence. He was of the opinion that every case of cancer should be treated individually, the special deterioration of the general health being given serious attention. Dr. Robert Bell, Glasgow, a prominent surgeon, had recently published an article in which he took the ground that cancer represented a retrograde metamorphosis of the tissues, brought about by a great variety of causes. He believed that every pathological growth in the body was liable to develop into cancer, and that, therefore, all such growths should receive prompt and serious attention. His great objection to the use of the knife was the danger of spreading infection by opening up channels of absorption. Dr. Bell had used in his cases, with very great benefit, thyroid extract in doses of five grains three times a day. This emphasized the fact that the successful treatment of cancer in the future would embody careful and rational medical treatment.

Dr. Marks, of Reading, said that the paper under discussion reminded him of a case operated upon on August 30. The patient was seventy-four years of age, and he had been suffering from hemorrhoids which had been treated by ligation. On the day mentioned Dr. Massey, of Philadelphia, was asked to operate. The slough came away between the tenth and twenty-fourth day. The case was doing nicely at the present time.

Dr. H. Grad said that if carcinoma were simply a retrograde metamorphosis of tissue, he would like to know why it should return locally after it had disappeared from the areas first involved. How was it also that metastasis occurred? Again, there were two classes of malignant disease, sarcoma and carcinoma. If these processes resulted simply from some change which the cells underwent, why should the resulting pathological lesion differ so widely? In sarcoma there was very little intercellular substance, whereas in carcinoma there was much intercellular structure.

Dr. Reyburn replied that the resisting powers of the cancerous tissue were not so great as those of normal tissues. The experiment of implanting healthy epithelium into the abdomen of an animal and producing cancer, was very significant. The fact that every cell in a cancer was nothing more than

the pre-existing cells of the part which had undergone change. The object of these remarks was to inveigh against the tendency to adopt a mechanical treatment, thus ignoring almost entirely the medical aspects. He had found that by attending to the hygiene and the special constitutional conditions he had secured far better results than by other means. He believed the physician was a very narrow-minded man who would not give his patients the benefit of all known methods, whether these were electrical, medicinal, or otherwise.

Dr. Massey thought there was much justice in the position taken by Dr. Reyburn as to the danger of looking upon this question in a too mechanical way. He would take exception to the idea that the scraping of epithelium and implanting it in the abdomen eliminated altogether the possibility of other germs having been introduced at the same time.

Dr. Eaton closed the discussion. He said that in the earlier years he had in several cases produced moderately severe burns. He had experimented with various electrodes, and had found that if he wished to use a current of 100 milliamperes or over nothing was so trustworthy as the clay electrode of suitable shape. As soon as he used one of these it was thoroughly wetted with hot water and placed in an electric oven. With the clay electrode, no matter how great a current strength, he had never had a burn. In many cases the positive pole was used internally. For the control of hemorrhage he made use of an uncovered zinc or copper electrode brought into direct contact with the mass. He would remind Dr. Massey that his cases extended back a number of years, and that mercuric cataphoresis was not known or understood at that time. It was only in the past two years that he had made proper use of the X-ray. In the internal cases of cancer he found the X-ray very efficacious, but at the same time he did not take any case of malignant disease and treat it with the X-ray alone, and in deep internal cancers he could not say that he obtained any special help from the X-ray. As a rule, he applied the negative pole internally except he wished to reduce the mass or control hemorrhage. He agreed with Dr. Massey that from the constant current one obtained a chemical as well as an electrolytic effect. He was of the opinion that with the constant current one obtained a certain chemical dissolving effect that was not obtained from the other electrical modalities. He had used the galvanic current very extensively for many years, and knew that 75 per cent. of the cases of uterine fibroids were symptomatically well; hence, he could not indorse the opinion that the constant current was old and might be neglected in favor of some of the newer modalities.

A CLINICAL REPORT ON THE USE OF THE "X-RAY" IN LESIONS OF THE SPINAL CORD.*

BY JOHN W. DANIEL, M. D., SAVANNAH, GA.

The idea of treating lesions of the spinal cord with the "X-ray" was suggested by the observation of certain effects it produced in the treatment of cancerous growths. The only object hoped for in the beginning was the relief of the pains of "tabes," and having two cases in my practice that had resorted to all other methods to obtain this relief, including the static spark, they readily consented to the use of the "Ray."

Case No. 1.—Male. Age forty-five. No history of syphilis. Duration of disease since a diagnosis was made seven years. Had suffered for several years previous to that from lightning pains which had been treated as rheumatism. At the time this patient came under my care two years ago, he was unable to walk without the assistance of a stick and a servant to hold him up. He presented all the classical symptoms of a tabetic patient. The symptoms that were mostly relieved by the treatment were as follows:

At the first sitting the spinal column was exposed to the rays beginning at the cervical region, and gradually lowering the position of the tube until the entire spine had been subjected to the rays. The time of exposure was about ten minutes. At this sitting I noticed that the patient soon began to sweat profusely, when the temperature of the atmosphere was only about 65° F. There was at the same time an increase of the pulse rate of ten beats to the minute. After the exposure there were no appreciable immediate effects, and I had the patient return the following day, and repeated the exposure. This was continued from day to day, always looking out for dermatitis. After ten exposures the patient complained of a decided weakness in his knees, and almost a total inability to stand even with assistance, but was willing to still continue the treatment.

After ten more exposures the patient stated that his legs seemed to be more useful, and he was able to stand alone with the aid of his stick. He soon began to walk to my office, and was able to clear the street crossings and curbings without any

* Read before the thirteenth annual meeting of the American Electro-Therapeutic Association, held at Atlantic City, September 22, 23 and 24, 1903.

difficulty. After a few more weeks of treatment he dispensed with his carriage and assistant, and was coming to the office alone to receive treatments. He was then capable of walking in the dark, and could stand alone and shave himself without taking any notice of his feet. After a few months more of treatment he was able to control his sphincter vesici, which was, at the beginning of treatment, giving him a great deal of annoyance. There also soon followed a return of sexual vigor and tone. Later on in the course of treatment the patient was able to discard his glasses which he had been compelled to use in reading. At the end of a year's treatment, without the aid of any other agent, the patient was able to walk for several miles without any assistance, and on one or more occasions crossed a railroad tressle several hundred yards in length without any hesitancy or uneasiness. He had gained ten pounds in weight, had discarded glasses, could control urine, could stand and shave himself, and was able to attend to his commercial business without any trouble. While there was a decided improvement in many ways there was no improvement in many other respects, the pupils were still characteristic Argyle-Robinson, there was an absence of patella reflex, and while pains had lessened in frequency there was not a cessation.

Case No. 2.—Male, age forty-five. No history of syphilis. Duration of the disease, ten years. Symptoms characteristic.

The patient was incapacitated for business, being also confined to bed the greater part of the time, owing to an inability to walk, even with the aid of an assistant. There was a complete loss of sphincter control, both anal and vesical, could not hold anything in his hand. There was complete loss of tactile sense in the hands and feet. This patient was treated in the same manner as the previous case, using a medium tube, at a distance of five to ten inches from back. The exposures were given through the clothing; starting at the cervical region, and the tube was gradually lowered to include the entire spinal column. The same increase in pulse rate and the profuse sweating were noticed, also the complaint that the treatment seemed to produce a weakness in the knees which was very distressing to the patient. The pains also seemed to be increasing in severity and frequency. After a few weeks of treatment the annoying symptoms produced at first all sub-

sided, and patient had a feeling of general stimulation. In this case, as in the previous one, the first symptoms to respond to treatment were the recovery of control of the bladder and rectum. This was soon followed by an ability to walk and stand without the aid of a stick, or holding on to an object. An increase in weight and appetite also took place. The patient soon resumed his business, and was able to travel alone on the cars, and take care of himself at hotels. This patient improved more rapidly than Case 1, but after a year's treatment, the pains still continuing, he resorted to various nostrums for relief. On one occasion he tried a new remedy to relieve pain, and was prostrated next morning, and totally unable to stand even with the aid of an assistant. This occurred about a year after treatment was started. But there seems to be permanent improvement, however, in some respects—that is, still retaining control of the sphincters. The other functions improved have again been destroyed or impaired.

These two cases fully demonstrate the advisability of applying the ray in degenerative lesions of the spinal cord, not that we hope to restore a destroyed area, but with the hope of arresting any farther progress, and the possibility of restoring other impaired functions.

Encouraged by the results with the two cases of tabes, and observing the restoration of control of the sphincters, I tried the X-ray in three cases of enuresis in children. In each case there was a complete return of control of the sphincters; the time to accomplish the cure in the cases varying. The young children seemed to respond more readily than the older ones. The tube employed in these cases was used as in the tabes cases.

The next experiment was on a case of spastic spinal paralysis. The case was of two years' standing, the patient having been the rounds of the hospitals, was pronounced incurable. I decided to carry out the same line of experimenting as in the tabes case, with the result that after a few months there was a complete restoration of all functions. This patient was bed-ridden when he applied to me for treatment. He was brought to my office in a rolling chair three times weekly; he had to be lifted into the office bodily, and held on the chair while the treatment was being administered. After a few weeks he was able to straighten his legs. This was soon followed by an ability to put some weight on the feet and legs. He procured a

pair of crutches, and was soon able to walk two blocks from the hospital to my office. After four months' treatment, with the X-ray alone, this patient was discharged as cured, and resumed his occupation as a peddler. Six months have now elapsed, and there is still no evidence of a return of the trouble. I now have under treatment a case of lateral sclerosis. This case, while improving, does so slowly, but still every point gained seems to be permanent, and there is not a progressing of the disease, which was very marked and rapid before the treatment was instituted.

I now have under treatment two cases of "arthritis deformans," one acute and the other chronic. While both seem to be improving, I am not ready yet to report the cases in full. One case in a male, age thirty-five, is so far improved that he has been able to resume work. The other case in an old lady, probably sixty-five years of age, was decidedly improved when she left the city for the summer, and has not yet returned, so I cannot say whether the improvement was permanent or not.

I hope that no one will think that I am claiming that the X-ray will cure tabes, or any other spinal lesion, where a degeneration is going on. My idea is to suggest the possibility of arresting these morbid processes, if taken at an early date in the history of the disease. While the time following the application of the X-ray in the few cases reported has been too short to say anything definite about the permanent results, the results obtained will warrant us in applying the remedy in other cases.

In the cases (eneuresis) where there were only functional troubles the remedy gave rapid and permanent results.

During the course of my experiments, I had also two cases of "herpes zoster" in which the pains were very severe, and the vesicles large and spreading rapidly over a large area. In both cases the pains were relieved by two applications of the ray over the affected area in the spine, and the relief of pain was soon followed by a disappearance of the vesicles; neither case lasting more than a week.

102 Henry Street, East.

ROENTGEN RAY IN THE TREATMENT AND CURE
OF CANCER, LUPUS, RODENT ULCERS, AND
ECZEMA, WITH HISTORIES OF CASES TREATED.*

BY ELIJAH WILLIAMSON, M. D.

In presenting this paper to the American Electro-Therapeutic Association, who are already surfeited with methods of curing hitherto incurable diseases, I anticipated your incredulity. Until very recently, I may safely say the most eminent surgeons of this country and abroad have been unanimous in declaring that the only feasible treatment of malignant growth is radical extirpation, and the cases inoperable owing to too far advancement or too vital location, are doomed to an early death, without hope, and oftentimes without an attempt on the part of the attending physician to secure a condition of anæsthesia.

I recall vividly the horror I felt invariably in my hospital days upon entering the ward assigned to inoperable cancer cases.

They were such cases as I wish to consider here: the facts and conditions of malignant cancers cured after but a few weeks' treatment.

In my experience I have had the best results, as shown in the following cases:

Case 1.—Mr. H., age seventy-one. Had been suffering from osteo-round-celled sarcoma on his right cheek for thirty years. The upper maxillary was partially exposed and the lower eyelid entirely destroyed, as well as part of the eyeball.

I treated him twice weekly for four weeks, and once weekly for six weeks, and once every two weeks until the end of twenty weeks, when the growth was softened and healed over, leaving a smooth scar.

The wound was exposed to the ray for ten minutes at each treatment.

Case 2.—Mr. M., sixty-four years old; was suffering from an enormous round-celled sarcoma of the neck, pronounced in-

* Read at the Thirteenth Annual Meeting of the American Electro-Therapeutic Association, at Atlantic City, September 23, 1903.

operable by three competent surgeons. Patient suffered great pain, could not take opiates, and was wishing every day to die.

He was a person one would give but a short, painful lease on life, and now within the incredibly short space of six months, is cured; the growth having disappeared, surface healed, patient free from pain and able to resume work. The transformation was almost miraculous.

Case 3.—Mrs. B., age twenty-seven. Had an operation for removal of cancer from the corner of her mouth one year ago, which healed up except a small place on the lower margin of the lip.

Recurrence became evident on the cheek and chin. This patient was placed under daily exposures of ten minutes for thirteen weeks, when the ulcer healed over with healthy skin and the tumor on the chin disappeared, and aside from the deformity the surgeon had made there was none.

Case 4.—Mr. J., eighty years of age. Had been suffering from cancer of the nose for many years. He was treated twice a week for sixteen weeks, when the ulcer had healed over and left a healthy scar.

Case 5.—Dr. Elder of this city came to me with Mrs. H., one of his patients, age sixty, who had an epithelioma of the right breast.

The nipple was entirely gone. A very aggravated ulcer was present, causing great pain and hemorrhage. She was treated three times a week for three weeks, of ten minutes' duration and once a week until she had seventeen exposures, when it was entirely healed with healthy tissue.

She experienced neither pain nor hemorrhage after the second treatment. The surrounding tissue was protected by a metallic shield.

Case 6.—Miss J. L. D., age forty-two. Had carcinoma of the left breast. The size of a lemon. She was treated once a week. After the fifth exposure the induration gradually decreased in size and the general condition of her health improved. After the fifteenth week the patient was discharged cured.

Case 7.—Mrs. D. B. L., age fifty-four. Came in for treatment for epithelioma of the right cheek. With the first treatment a diminution in the secretions was noticed and a firm crust formed. At the end of nine weeks a healthy scar replaced the sore.

Lupus Case 1.—Mrs H. M. S., age twenty-eight. Suffering from lupus vulgaris of the face and nose. Ointments, cauterization, and excision had been tried, but the lupus always returned.

The X-ray treatment was used once a day for ten days, then once a week, improvement was noticeable after the seventh application. At the end of three months the disease had disappeared, leaving the skin soft and smooth.

Case 2.—Miss W. B. W., age eighteen. Had lupus of three years' standing, extending over nose and both cheeks. Had undergone various treatments with but little benefit, when she was treated by the X-ray. She was greatly emaciated and could sleep but little. Improvement was noticeable after the ninth exposure. At the end of thirteen weeks the entire ulcer had disappeared. I saw the young lady six months after she was discharged, and no one could tell that she had ever had the disease.

Rodent Ulcer.—Mrs. S. M., age fifty-two, came to the city for treatment, a diagnosis of rodent ulcer of her hand having been made. She was referred to me. After five exposures (two a week) a reaction began, and at the end of four weeks the ulcer took on a clean, smooth appearance.

Treatment was continued once a week for three months and case was discharged cured.

In eczema I have treated many cases that resisted all other methods. The X-ray was applied and the patient was cured with from six to ten exposures. Dr. Smick of this city came to me with eczema of his hips, extending over the sacrum. A space the size of my two hands had caused him much annoyance by the intense itching. He had had the disease about eighteen years.

The ray was applied once per week for five weeks. The itching stopped after the first application. The skin has regained its natural color and he has had no recurrence six months since.

Dr. Callahan of this city brought his wife to my office with eczema of the hands. She had been a sufferer for twenty years. Had tried many kinds of ointments and blood medicines with but little relief.

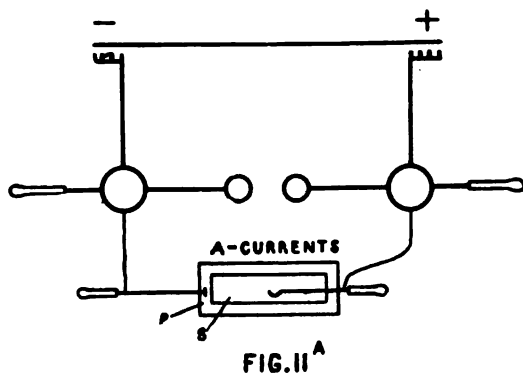
The ray was applied for ten minutes twice per week for four weeks, and for eight months no symptoms have returned.

Rooms 213-214-215 Rose Dispensary Building, Terre Haute, Ind.

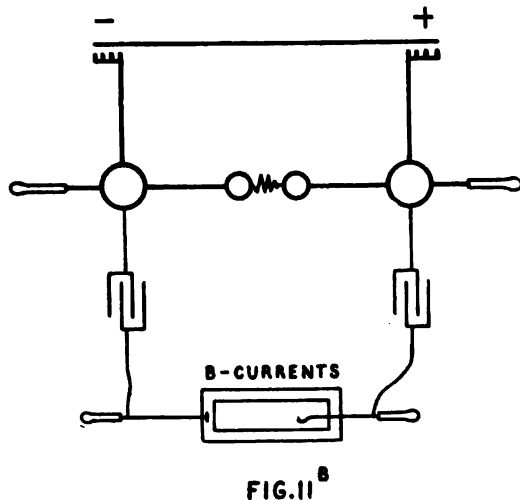
REPORT OF THE COMMITTEE ON CURRENT CLASSIFICATION AND NOMENCLATURE.*

(Continued from page 234.)

Different Currents Produced.—An effort was made to obtain information of some of the characteristics of the cur-



rents which are yielded by the Holtz machine under different conditions. Three different arrangements of the machine



were employed, and are indicated diagrammatically by Figs. IIA, IIB, IIC.

* Read at the Thirteenth Annual Meeting of the American Electro-Therapeutic Association, at Atlantic City, September 24, 1903.

By the arrangement shown in Fig. 11A, currents, distinguished as A-currents, were taken directly from the discharge knobs without a discontinuity of conduction in the circuit.

By the arrangement shown in Fig. 11B, currents, distinguished as B-currents, were taken from the outside coatings of two Leyden jars, whose inside coatings were in contact with the two separated discharge knobs between which a discharge was taking place.

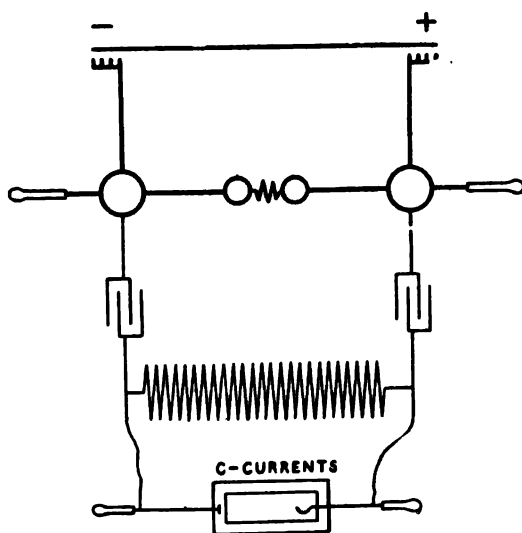


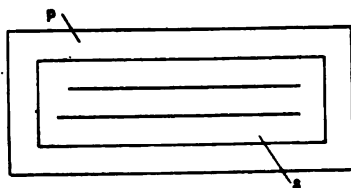
FIG. 11^C

By the arrangement shown in Fig. 11C, currents, distinguished as C-currents, were taken from the terminals of a coil, which were also connected with the outside coatings of two Leyden jars, the inside coatings of which were connected with the two separated discharge knobs, where a discharge was taking place. The coil consisted of 25 turns of No. 12 stranded and insulated conductor wound upon a round glass bottle $4\frac{1}{2}$ inches in diameter.

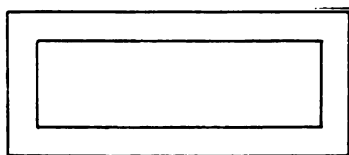
Electrolytic Solution No. 1.—Strips of blotting paper were soaked in a solution made in accordance with the following formula, and having the property of turning blue when a current is passed through it, if the anode be of iron:

Ammonium Nitrate	25.	grams
Ammonium Chloride	12.5	"
Ferricyanide of Potassium	1.3	"
Water	1000.	"

These strips S (Fig. 11A) were placed upon a plate of metal P, which was connected successively with one of the points of connection for the various currents. An iron wire, bent into a loop, was connected with the corresponding remaining terminals. The loop was then drawn across the top of the strips. The results are indicated in Figures 12A, 12B, 12C.

FIG. 12^A

As indicated in Fig. 12A, with A-currents a continuous, firm, blue line was produced when one discharge knob was connected with the iron wire loop, which was drawn across the paper strip S, and the other knob was connected with the metal plate P, but no mark was made when the connections with the knobs were reversed.

FIG. 12^B

With B-currents, as shown in Fig. 12B, the paper strip did not appear to conduct the current well, and no matter which knob was connected with the iron loop, no distinct coloration was present.

With C-currents, as indicated in Fig. 12C, there was also no marked coloration. The slight coloration present was probably due to a painting effect resulting from decomposition of a film of the solution, which adhered to the wire and was decomposed by the passage of sparks.

Figures 13 and 14 show the results by this method of registration respectively obtained by currents having frequencies

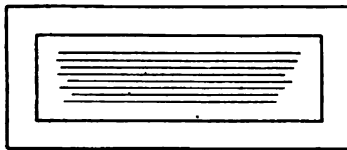


FIG. 12^c

of 40 and 60 cycles per second, which were generated by an ordinary alternating current dynamo.

Electrolytic Solution No. 2.—Two bare copper terminals leading from the current sources were next dipped in a solution of potassium iodide and starch. The solution con-

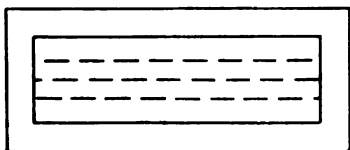


FIG. 13

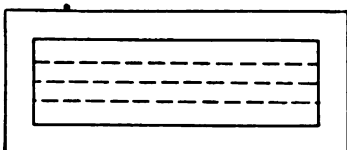


FIG. 14

ducted A-currents, but acted like a dielectric with B- and C-currents.

With the two latter currents, if the portions of the wires under the solution were brought close to each other, and the portions of the wires outside of the solution were far enough apart to prevent discharge between them, a disruptive discharge would take place underneath the liquid; frequently of mildly explosive violence.

With B-currents and C-currents the liquid did not appear to conduct *underneath* the surface, but *on* the surface, the same as on a hygroscopic surface of glass. The discharge in the last case sprayed out and was luminous.

Physiological Effects of These Currents.—The apparent physiological effect of A-currents is the same as that of any direct currents of the same magnitude. While holding the discharge knobs in the hands they may be brought close to each other and no spark passes between the knobs.

B-currents are uncomfortable to experiment with. Only minute sparks pass between the terminal knobs when they are held in the hands and brought close to each other. C-currents are borne with comfort, and if the thumb knuckles are brought opposite to each other, and within $\frac{3}{4}$ inch in some cases, while the hands are grasping the terminals, disruptive discharges may occur between the knuckles, indicating a difference of potential of thousands of volts between the two hands. There is a sensation of heat in the knuckles.

C-currents passed through a hot-wire ammeter registered 0.32 amperes. A small incandescent lamp was also brought up to proper incandescence by C-currents.

The time during which this apparatus has been available for experiments has not been sufficient to allow of the announcement of anything more than the foregoing provisional results, which should be confirmed and elaborated by further experiments, conducted under varying conditions of humidity and by the aid of additional machines of various patterns and manufacture.

The general proposition which appears to be established by the trials thus far made, can be expressed as follows:

At a constant speed the Holtz machine generates a current of constant amperage, irrespective of the distance apart of discharge points or knobs. And the reason why the ammeter did not indicate a constant current flow during the experiments described, with the discharge points at different distances apart, was because an increasing percentage of the current leaked around instead of passing through the ammeter due to the increasing potential difference as the points were drawn farther apart.

NEW YORK, Sept. 16, 1903.

Chairman of the Executive Committee, American Electro-Therapeutic Association.

DEAR SIR:

I have read the report of Dr. Sheldon as a member of the Committee on Current Classification and Nomenclature, detailing tests made on Holtz electrical generators suitable for therapeutic use. I am greatly interested in this work, which is in the direction of bringing within the domain of accurate

knowledge the characteristics of this class of machines, which have during the past few years been so widely employed, in the effort to mitigate suffering, cure disease, and thus lengthen human life. The intelligent physician who experimentally secures gratifying results by empirical combinations of his electrical apparatus is anxious to know the peculiarities of the currents he is using, and how those currents are modified by changing the conditions of operation in the circuit. The electrical engineer is endeavoring to co-operate by furnishing such information.

Without having had time because of pressure of business to follow out the calculations in the record of experiments of Dr. Sheldon, I am informed that Messrs. Jenks and Clarke have given it careful study, and I believe that his report summarizes valuable introductory work in this field. Of necessity the present deductions from that work are based upon the performance of only two machines under specific conditions, and further experiments and applications of the methods devised may and doubtless will lead to some modification of the statements which can now be made. Those further experiments should, in my judgment, be pushed cautiously but as promptly as possible, to the end that the steps now being taken by many medical men shall be guided within the limitations outlined by this advanced work in a field hitherto practically untrodden or imperfectly explored.

Probably no electrical engineer, and perhaps no physician or surgeon, realizes how much time has been and is being wasted, and how much the attainment of a merited confidence on the part of the great public in the use of electricity in certain cases as a remedial and healing agent is being retarded, by the lack of information of the character which your Committee, is, under the disadvantages of business pressure in other directions, endeavoring to supply.

Very truly yours,

ELIHU THOMSON.

STATIC APPARATUS AND COMBINATIONS.

BY W. J. JENKS AND C. L. CLARKE.

The modern Holtz Influence Machine is a *direct current* generator, within the meaning of the definition of direct current as given in the report of this committee last year. Its current, from the plates to the combs of the prime conductors, is uni-directional. Indeed it is more than that, for it is a *continuous current* generator; that is, its direct current never falls to zero while operating. In fact it is still more than that, for it is a *constant current* generator; that is, with constant speed and other steady conditions, its uni-directional, continuously flowing current is of practically constant value. Even more than this may be said, for the E. M. F. is so uniform and the resulting current output is so smooth and even that it is comparable with a voltaic current from a chemical battery. Thus it is an ideal source of continuous and constant current up to what is, from a medical standpoint, a considerable ampere output, as appears from Dr. Sheldon's tests.

Now in order to transform so beautifully uniform a flow into one possessing either pulsatory or alternating or oscillatory characteristics, it is necessary to introduce into the circuit something more than a plain resistance, because such a resistance will simply establish a constant current of greater or less amperage according to the value of the resistance without changing the character of the output.

If interrupted direct current is needed, it may be secured either by a condenser or the *static-induced* combination of Dr. W. J. Morton, assisted by a resistance sufficient to damp out (straighten) the naturally oscillatory discharge.

If high frequency oscillatory effect is the object, the circuit should include a condenser having small capacity relatively to the resistance and inductance, or should have small resistance in its relation to the capacity and inductance, or low inductance when compared with the resistance and capacity. A condenser of large capacity will tend to produce relatively slow oscillations. Impedance (which represents the sum of the effects of ohmic resistance and inductive resistance) will tend to oppose the rapid oscillations naturally produced by a condenser of small capacity.

The influence exerted upon the circuit and the current by these modifying devices and conditions of operation, are definitely and accurately known, and the effect of any proposed combination of devices can be mathematically determined in advance by the electrical engineer.

But therapeutics presents another element which is omnipresent in observed and calculated phenomena of static applications—the living human subject, the useful translating device, the beneficiary, for whose sake all the work is done, in whom alone must appear any utility which is possessed by the entire combination of apparatus. This essential element is, to the investigating physician and engineer (so far as your committee knows) an unknown quantity in its effect upon the currents generated and modified in the other parts of the circuit.

We can measure the quiescent resistance offered by the human body to the passage of infinitesimal currents, including, of course, the contact surfaces, which constitute a large percentage of the whole. Such measurements indicate a great variation of total body resistance. We can also measure that resistance when traversed by lethal currents, such as those employed by the State in the electrical executions of criminals.

In a paper which Mr. Jenks read before this Association at the meeting of September 25, 1894, in New York, he quoted the following reply to an inquiry, which he had then recently received from our fellow member, Professor A. E. Kennelly, now of Harvard University:

“I think that a high pressure brought to bear upon a man's body between any two points, finds the resistance initially just what we measure it by the bridge, but that it breaks down at a rate rather difficult to foresee. Also that valuable experimental measurements could be made (as you suggest) of the resistance in different parts of the body. . . . I think that an accurate knowledge of the resistance from point to point of an average human body might assist occasionally in the diagnosis of disease, and the comparison with the resistance of a corpse might have useful results to show.” (Transactions of the New York Meeting, 1894, p. 66.)

We are not aware that during the nine years that have passed since that statement was made any systematic experiments have been attempted in this direction of learning the

behavior of the living tissues under the stresses of current flow, considering them as collectively constituting a very important fraction of the circuit. Much less do we think that any adequate investigation has been made of the impedance opposed by a living subject to the passage of those stimulating and healing currents which you are so constantly employing. Whether or not practically important counter electro-motive forces are developed in the tissues traversed, to what extent high frequency oscillations are damped out by them, and whether these currents travel through the tissues or on the surfaces, no one knows by observation, so far as we have read or heard.

This physically active section of the external circuit must therefore be investigated in the effort to formulate the curves of currents actually employed, and thereby secure a substantially valuable classification.

We have not lost sight of the valuable paper read by Dr. Kellogg at the Chicago meeting in 1893—Minutes, p. 137-155, which was illustrated by curves of the currents used by him in his practice—that is, currents given by the several sources of electrical energy, as modified by his secondary apparatus. But we have not found in that paper any evidence that these characteristic curves were made with the patient included in the circuit. Whether they were or not, he did not show how the currents delivered by the sources were modified by the introduction of the patient's resistance, capacity and possible inductance.

From a statement of combinations furnished the Committee by Dr. W. B. Snow and others, we give the following list said to be used in practice.

This list will be rendered more valuable by a graphic showing of the classic work of the old practitioners, the diagrams which illustrate them (Figures A and B) being merely simplified reproductions of those contained in the report of the Committee on the Static Induced Current, of which Mr. Jenks was a member, in 1901. With these old arrangements clearly in mind, the advances shown by some of those which follow will more readily appear.

The + and — signs in these diagrams respectively represent positive and negative conditions of electrical charge the instant before the spark passes and discharge commences to take place.

We quote in connection with the diagrams, some of the descriptive terms and phrases employed by our informants to indicate the arrangements of apparatus with which they are associated. Some of them have no technical significance and are misleading or confusing. Further investigations will probably indicate more appropriate terms.

CAVALLO APPARATUS, 1780.*

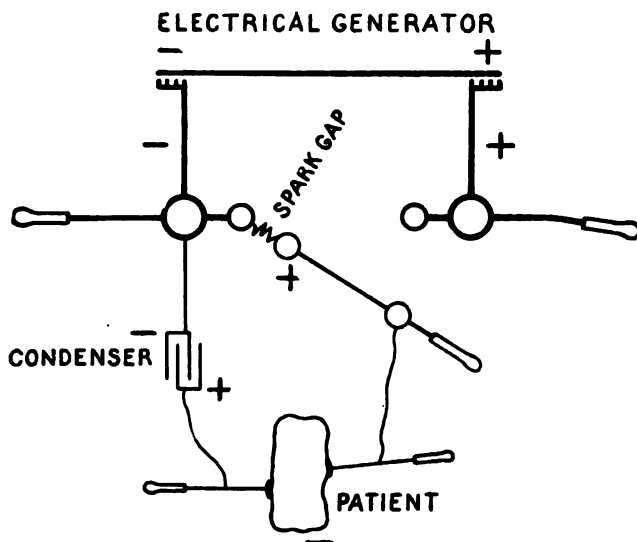


FIG. A

The patient was subjected to current due to the spark discharge of a Leyden jar condenser, the inner coating of which was connected to one collector, or prime conductor, of a frictional machine. The other collector (in the books, the positive) was not used. The patient was thus in series with the spark gap and two coatings of the Leyden jar. The electrodes were applied to the patient before the machine was rotated. The patient need not be insulated, as the discharge circuit was

*Mauduyt, in *Histoire Société Royale de Médecine* ; 1780-81 ; p. 293 and Plate I.

Cavallo, in *A Complete Treatise on Electricity in Theory and Practice*, 3d edition, 1786 ; Vol. II. p. 119 and Plate V.

strictly local, the condenser being the source of the effective current. When discharged through a circuit of low resistance and inductance the current is oscillatory, and may have fairly high frequency if the condenser is not too large. Cavallo probably appreciated that the existence of an earth connection added practically nothing to the capacity of his condenser.

DUCHENNE ARRANGEMENT, 1872.*

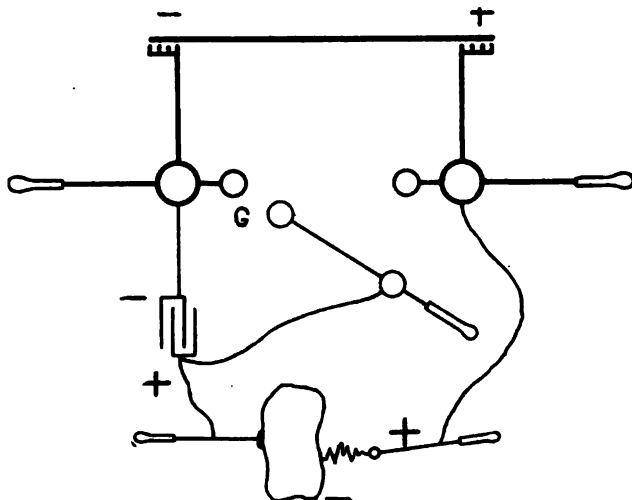


FIG.B

The patient was subjected to the direct spark discharge against his person of a Leyden jar condenser in series with the spark gap, the positive and negative prime conductors, and the generating parts of the machine. The spark gap was between one electrode and the patient. The electrode connected with the outside coating of the condenser was placed on the patient, and the machine operated so that the patient was positively charged by the outer coating, and the electrode connected with the positive prime conductor was then approached toward the patient until the spark passed directly to him from the electrode. The condenser was short-circuited by an adjustable air gap G to prevent too high charg-

*Duchenne, in *L'Électrisation Localisée*, 3d edition, 1872 ; p. 43.
Tibbitt's Handbook of Electricity, London, 1873.

ing of the condenser. The patient need not be insulated, the circuit being also local in this case although including the generator. Under ordinary practical conditions probably the current through the patient would be a direct current, or at most oscillate slowly.

MORTON "STATIC-INDUCED CURRENT" HIGH-FREQUENCY APPARATUS.*

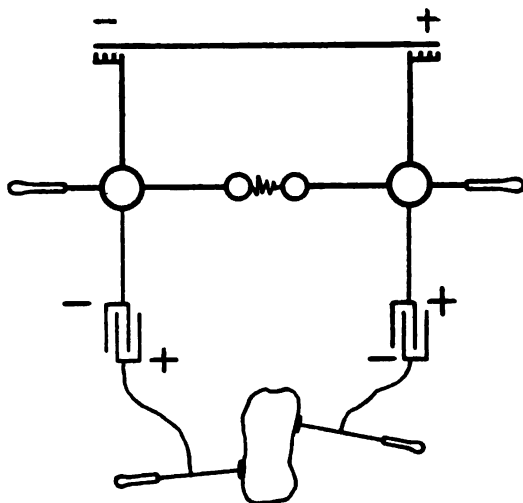


FIG.C

The patient is directly in circuit with the outside coatings of two Leyden jar condensers in series. The spark gap and machine are in multiple with each other. With the patient included in circuit in the manner shown in the diagram we do not know the value of the inductance and resistance offered by him. The arrangement of two condensers of small capacity is conducive to the production of oscillatory currents of relatively high frequency, and such currents will be produced if the patient offers a sufficiently low resistance and inductance. In the July, 1903, issue of *Medical Electrology and Radiology*, Dr. Manders expressed the opinion that the impedance (sum of the resistance and inductance) of the circuit including the patient may be so great as to render the cur-

*Dr. W. J. Morton in *The Medical Record*, pp. 365-371, 395-398, 438-440, April 2, 9, and 16, 1881; and pp. 97-104, January 24, 1891.

rent unidirectional by damping out the oscillations which the condensers of small capacity tend to produce.

The term "static-induced," applied by Dr. W. J. Morton to this arrangement, made by him in 1881, is technically accurate (Report of this Committee, 1902; see *JOURNAL OF ADVANCED THERAPEUTICS*, Vol XXI, No. I, Jan., 1903, p. 29). This term expresses the arrangement by which, as is now generally understood and conceded, currents of the character technically known as high-frequency currents were first produced, and applied to therapeutic purposes in such a way as to be tolerable to the patient; and on the basis of which arrangement some subsequent arrangements are founded, for example that of d'Arsonval (Figs. D and D²) also those more recently devised by Dr. Morton (Figs. O and P), and that of Dr. Files (Fig. Q).

D'ARSONVAL HIGH-FREQUENCY APPARATUS.*

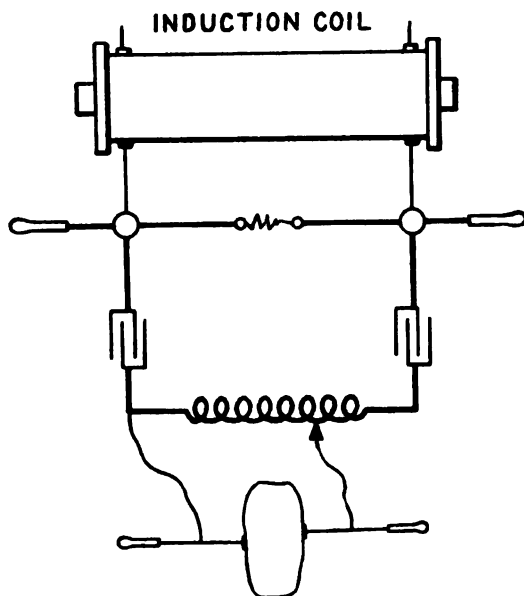


FIG. D

The terminals of the secondary of an induction coil are respectively connected with one terminal of each of two con-

* D'Arsonval, in *Comptes Rendus*, Vol. CXVI, 1893, pp. 630-633; read March 20th. In this paper d'Arsonval stated in substance (a) that he had

densers. A spark gap is placed across the secondary circuit. The other two terminals of the condensers are connected with the ends of a short coil of a few turns of thick copper wire. One electrode is connected with one end of the short coil and the other electrode is adapted by a sliding contact to include in circuit with the patient any desired length of the short coil, and thus regulate the effect produced upon him. A straight rod, or tube, of copper may be substituted for the short coil to increase the frequency of the current, by diminishing the inductance. A static generator may be substituted for the induction coil. Currents of exceedingly high frequency are produced by the d'Arsonval apparatus. When currents of much higher potential are desired they can be obtained from a fine wire coil of relatively many turns, inclosed in a glass tube filled with petroleum, and inserted in the thick wire coil.

That the frequency must be exceedingly high is proved by an experiment made by Dr. Sheldon. In place of the induction coil for producing the spark at the gap, he employed a Holtz machine (Fig. D2).

Instead of the short coil of thick copper wire connected with the outside coatings of his Leyden jars, a thick straight copper rod C was used by Dr. Sheldon, with the ends of which the electrodes were also connected. Upon holding the electrodes in the hands and approaching the thumb knuckles toward each other a stream of sparks passed between them when still a quarter of an inch or more apart, and without any disagreeable sensation. Probably not less than 15,000 to 30,000 volts pressure was required to cause the sparks to jump the distance mentioned, and such a potential difference between the ends of the rod, considering its

communicated to the Société de Biologie, Feb. 24 and 25, 1891, the "astonishing fact" that when the frequency of a current was very great excitation of the nerves and muscles was not produced; (b) that the sparking distance—and therefore potential difference—between conductors connected with the ends of the short, thick wire coil was greater than at the spark gap across the secondary terminals of the induction coil; (c) that a very strong oscillating, high-frequency current was produced, sufficient to raise a one-ampere incandescent lamp to a white heat when in series with two persons completing the branch circuit between the terminal of the thick wire coil; (d) and that he had been able to generate in a branch circuit, including his own body, a current of more than three amperes without any other effect than a sensation of heat in the hands.

very low resistance and inductance, could only be produced by a current of exceedingly high frequency.

That a current thus produced might reach at least 300 to 400 milliamperes (although of greatly reduced voltage) was demonstrated by the fact that it brought the carbon of a 16-candle incandescent lamp to a dull red glow when the lamp

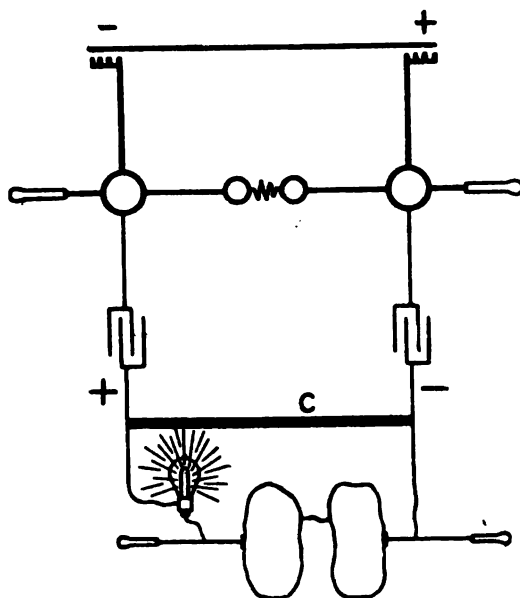


FIG.D²

was placed in series with two men connected with the rod terminals, in which case this large current caused no physical inconvenience. This may indicate that the current was caused to flow over the surface of their bodies because of high frequency, just as in the same test the current flowed mainly over the surface of the copper rod, instead of being of practically uniform strength throughout its entire cross-section, as it would be with a low frequency.

TESLA HIGH-FREQUENCY APPARATUS.*

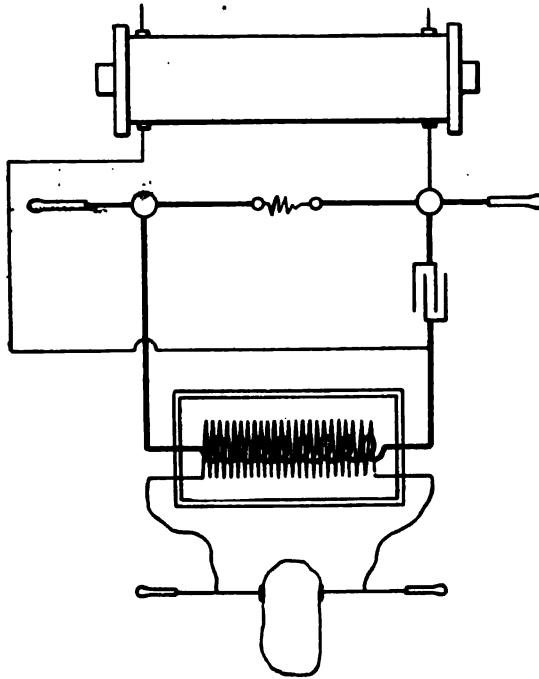


FIG. E

The terminals of the secondary of an induction coil are respectively connected with the two terminals of a condenser,

* Nikola Tesla, in Transactions, American Institute Electrical Engineers, Vol. VIII. pp. 267-319, New York, May 20, 1891; and Journal, Institution, Electrical Engineers, Vol. XXI. pp. 51-163, London, February 3, 1892. In an article on Phenomena of Alternating Currents of Very High Frequency, published in The Electrical World, Vol. XVII. pp. 128-130, New York, February 21, 1891, Tesla referred to the physiological effects of high-frequency currents in the following words: "The writer's experiences tend to show that the higher the frequency the greater the amount of electrical energy which may be passed through the body without serious discomfort; By taking the globe of a lamp in the hand, and by bringing the metallic terminals near to or in contact with a conductor connected to the coil [that is to say, connected to one terminal of the secondary of an induction coil whose primary is energized by an alternating current of very high frequency] the carbon is brought to bright incandescence and the glass is rapidly heated. With a 100-volt 10 c. p. lamp, one may without great discomfort stand as much current as will bring the lamp to a considerable brilliancy; but it can be held in the hand only for a few minutes, as the glass is heated in an incredibly short time."

and the latter are also connected with the ends of a coil of a few turns of thick copper wire in circuit with which a spark gap is intercalated. This coil is surrounded by a coil of a larger number of turns of finer wire for the purpose of obtaining a high potential, and to the ends of this fine coil the electrodes are connected. The coils are placed in a vessel filled with oil to insure the integrity of their insulation. Currents of exceedingly high frequency are produced by this apparatus.

MORTON "WAVE CURRENT" HIGH-FREQUENCY APPARATUS.*

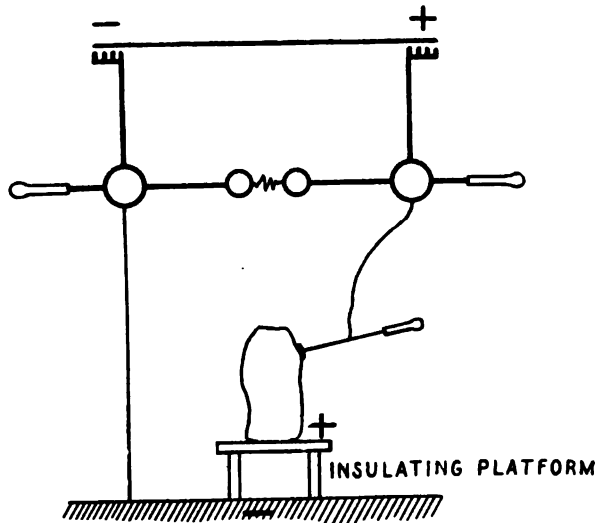


FIG.F

In this arrangement, which the Committee believes originated with Dr. W. J. Morton, one prime conductor of the static generator is grounded; the other is connected with an electrode applied to the patient who is on an insulating stand. The current received by the patient is due to the spark discharge between the knobs of the prime conductors. The patient forms one

* Dr. W. J. Morton in *Bulletin Officiel de la Société Française d'Électrothérapie*, January, 1899; and *The Electrical Engineer*, Vol. XXVII. pp. 245-246, New York, March 2, 1899.

coating of a Leyden jar condenser, the other coating of which is the earth and surrounding objects and walls connected electrically therewith.

The greater part of the charge and resulting strain on the dielectric air will be found at those parts of the patient and floor or walls of the room that are nearest together.

If the spark gap be long, the time of charging by the small continuous current will also be comparatively long, because the potential must be raised to a high point in order to produce a long spark. The duration of the discharge, which will probably be an oscillatory one of relatively high frequency because of the small capacity of the condenser, will be short. The small continuous charging current will flow through the patient without causing appreciable sensation. The sudden oscillatory discharge may flow over the surface of the patient because of its high frequency, and therefore without disagreeable effect. As the length of the spark gap is diminished, the time and amount of charge become less, with a resulting diminution of sensation.

MORTON "WAVE-DERIVED CURRENT" HIGH-FREQUENCY APPARATUS.*

This arrangement is like that last described with the addition of a second electrode applied to the patient and connected with the inside coating of a Leyden-jar condenser. In this case the patient and inside coating together, constitute

* This arrangement, differing somewhat in details from that shown in Fig. G, was described by Dr. W. J. Morton, in a paper read, September 26, 1900, before the American Electro-Therapeutic Association, and published in the Transactions of the Association, 1901, pp. 290-291 and Fig. 6. Instead of connecting one electrode with one coating of a Leyden jar, the other coating being connected to earth, Dr. Morton connected the same electrode with a sheet of zinc, two feet wide and five feet high, supported on an insulating tripod stand. The zinc sheet constitutes one plate, and the neighboring grounded objects and walls of the room constitute the other sheet of a condenser, which, although of large surface, will have a small capacity because of the great distance, or thickness of the dielectric air, between the plates, and comparable to the capacity of a very small Leyden jar. The assured small capacity of this arrangement prevents the possibility of giving the patient disagreeable or dangerous shocks, care being taken that the zinc sheet is so far from other grounded objects that a spark discharge cannot pass from one to the other.

one plate of a condenser, the other plate being the earth adjacent to the patient and the outside coating of the condenser with a dielectric interposed between the latter and earth. The arrangement can be modified by connecting the outside coating of the jar with the earth, in which case the patient and

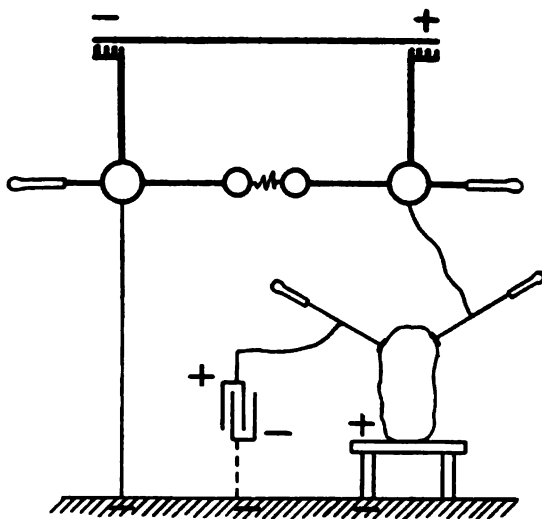


FIG.G

inside coating form one plate of the condenser, and the earth and outside coating constitute the other plate. The first arrangement appears to be practically the same as the "wave current" combination; that is to say, there is no essential electrical difference. The second, in which the Leyden jar is grounded, greatly increases the capacity of the condenser as a whole, and practically eliminates the body of the patient as a part of the condenser, instead of which he becomes a section of the conductor and is obliged to convey the current; for which reason, when the jar is grounded, one of very small size should be used to avoid danger of subjecting the patient to an injuriously strong shock. When a very small jar is used this arrangement should give a current of fairly high frequency.

THE SUCCESSFUL TREATMENT OF EIGHTEEN
CASES OF GRANULAR LIDS BY THE X-RAY AND
HIGH-FREQUENCY VACUUM ELECTRODES.*

BY ALBERT C. GEYSER, M. D.

Granular lids or trachoma is too well known to require very much of a description; hardly an institution or school exists, even under the most rigid sanitary conditions, which has not always one or more of these cases on hand; we know this disease to be contagious and most rebellious to treatment, still, so accustomed have we become to seeing it that it has grown upon us, and by its very constancy has become one of the evils to be tolerated.

How often do we see children and even adults with granulated eyelids, apparently never giving themselves any concern whatsoever; the fact, however, remains that these same cases have been treated and by competent men, at proper institutions, as well as at home, yet the disease remains and the average ophthalmologist must be satisfied if he can relieve a certain percentage and keep others from growing worse.

One of the most dreaded complications of this disease is the formation of pannus, which is of course hardly a complication, but simply an extension or invasion of different tissue by the same morbid process.

It is this percentage of chronic cases that have failed to be relieved by the ordinary methods that we wish to consider in this paper, and we will do this as expeditiously as possible, so that if this paper possesses no other merit, it shall at least possess the merit of brevity.

History informs us that this disease has been known for centuries, and strange as it may seem, the treatment instituted by the ancients is as effective to-day, and with little modification used at present, by every eye surgeon; namely: scarification, and expression or removal of the granular material.

Ætiology or symptoms need hardly be considered here; they are found stereotyped in all text-books; in fact, we have all read and reread them, that is we have them committed to memory.

* Read at the Thirteenth Annual Meeting of the American Electro-Therapeutic Association, at Atlantic City, September 23, 1903.

Pathology, however, is entitled to more serious consideration, for treatment of any kind not in harmony with the pathology of the disease can hardly be called scientific.

In trachoma we see an excessive degree of development of the papillæ of the mucous membrane and the formation of the granulations.

Microscopically the granulations may have an imperfect capsule or may have no capsule, but they seem to grow from, or in, the stroma of the conjunctiva. In the acute form the granulations consist of the lymph cells alone. They are to be regarded as new growths in the conjunctiva, and in addition to the lymphoid cells, the mass of cells and connective tissue is penetrated by blood vessels.

The chronic granulations consist of lymph cells toward the surface, but their bases are chiefly formed of connective tissue. Gradually the cellular elements are transformed into connective tissue, and in this way cicatricial degeneration of the conjunctiva is brought about at each spot where a granulation was seated.

To sum up: the pathological condition consists of a chronic inflammatory process, causing dilatation of the blood vessels, the consequent formation of a new growth or granulating material, with subsequent degeneration and the formation of connective tissue, which eventually contracts, causing the deformities of entropion or ectropion.

Treatment.—The chief aim of the treatment must be to check the development of the hypertrophy of the conjunctiva and bring about absorption of the granulations, in order to prevent the destruction of the mucous membrane and to reduce the previous results of the disease to a minimum.

In the light of modern electro-therapeutics what is more logical than the application of the X-ray to check the development of hypertrophy and cause protoplasmic contraction, thereby limiting—in fact, preventing—the further formation of granulating material.

A few exposures, six to eight, will suffice to bring about this much-desired result.

Our second consideration is to cause absorption and to stimulate normal nutritional processes; nothing seems to answer the purpose any better than the direct contact of the tissues with a high-frequency vacuum tube generated by a static machine, X-ray coil, or Kidder High-Tension Apparatus.

Technique.—The patient is seated. With a little vaselin anoint the margin of the closed lids, paying especial attention to the lashes; now, a strip of adhesive plaster 1-2 inch wide is caused to adhere to outer surface of the eyelid, so as to appear as a prolongation of the lid; should it be the lower lid that is being treated, a small lead weight about 1-4th of an ounce is fastened at the other end of the adhesive tape, which should be about two or three inches long; place a wire probe, lead pencil, or similar object under the eyeball on the outer side, make gentle traction and the lid will become everted to its fullest extent and remain so by suspending the weight; if the upper lid is to be treated, the same process is to be applied, but the weight is then passed over the head of the patient and allowed to exert its traction in that manner. A shield of rubber composition with a circular perforation the size of a 25-cent piece is brought close to the face of the patient, and through this aperture the X-ray is allowed to act for a period of three to five minutes on alternate days for about two weeks. No harm has as yet been experienced from the exposure of the eyeball if the tube is brought no nearer than six inches.

After about six or eight such X-ray exposures, the lids are prepared in the same manner and a high-frequency tube is brought in direct contact with the entire conjunctiva, being careful not to cause undue irritation by the moving of the vacuum electrode over the mucous membrane; this is continued for one to three minutes, the lids are then released and a similar application with a broad flat vacuum tube is then applied to the closed eyelid on its outer surface.

A probe wrapped with a little cotton, which is moistened in some clean water and occasionally passed over the everted lid, seems to be very grateful to some patients.

The vacuum tube treatment should be continued for from one to three weeks as the requirements of the case may demand.

The eighteen cases referred to were cases promiscuously selected, some occurring in private practice, some from institutions, still others were referred by eye surgeons.

The details of one case will practically answer for all:

Mr. N., forty-three years of age. Occupation, school-teacher. Referred by Dr. Skell of New York in January, 1903.

Trachoma is present in upper and lower lid on left side only,

of, now, eight years standing. The lower lid is studded with granulations and through cicatricial contraction the lid is inverted, causing the cilia on the margin of the lid to continually irritate the cornea, which is already cloudy, with some interference of vision.

This case was subjected to the treatment as outlined above; after the fourth exposure to the X-ray a mild reaction appeared, which caused no inconvenience, the tube was simply removed a greater distance, and the time shortened until eight exposures had been made.

The high-frequency vacuum electrode was now substituted and continued on alternate days until the end of March, when the patient declared himself free from all pain and irritation, his sight almost as good as in the other eye, and to all appearances completely cured.

Six months have passed since his discharge and no recurrence has taken place; he remains well.



INACCURATE CHEMICAL EXPRESSION AS AN IMPEDIMENT TO FREER USE OF AMERICAN MINERAL WATERS.

BY GEORGE THOMAS PALMER, M. D.,

Editor of the Chicago Clinic and Pure Water Journal, Chicago.

There can be no question in the mind of the well informed medical men but that mineral waters of various kinds, when properly used, are of great therapeutic value. The "cure-all" notion commonly held by the layman and exploited by some of the less principled resort owners, is of course, untenable to educated physicians, but the bigoted skepticism, formerly quite common to medical men, is being rapidly relegated to the days of unreasoning incredulity. To be sure, the medical men of the country have not given to "crounotherapy," as Solis-Cohen* has chosen to call the therapeutic use of mineral waters, the careful consideration that it deserves, but the better class of medical men has long since ceased to deny the therapeutic value of the various waters.

Denying the impossible, we have ample evidence of the value of mineral waters in so long a list of diseases, such positive proof that mineral waters will, at times, accomplish results when other therapeutic agencies fail, that we have no longer a legitimate excuse for declining to seriously study this branch of therapy.

Among those who are most interested in mineral waters, there is a disposition to condemn the medical profession for the marked negligence of this subject, and there can be no question but that the ignorance of the average medical man on mineral springs is astonishing; but we are fairly brought to face the question as to whether the information necessary to intelligent application of mineral waters is available, even if our medical men earnestly wished to utilize the waters.

On first sight, it would seem remarkably easy to determine the merits and demerits of the various mineral waters with no further investigation than a consideration of the water analyses. All of the springs which are at all before the public have analyses prepared by more or less competent chemists and it might be assumed that, with a fair knowledge of therapy, one

* Solis-Coben, "System of Physiologic Therapeutics."

might fairly judge the applicability of a water by consideration of the mineral elements of the water.

Unfortunately it has been found that the analyses and the clinical findings are seldom in harmony, and we are frequently told of waters of the same analysis having entirely different physiologic action. In fact, a careful study of mineral waters has taught me that very little reliance can be placed upon the customary analysis in determining the medicinal uses of a water.

As an evidence that the analyses published by the various springs cannot be relied upon by the medical man with any certainty that he can determine the uses of the water thereby, Mason* states that "the numerical results of a water analysis are not only unintelligible to the general public, but are not always capable of interpretation by the chemist."

It is my opinion that it is the intelligible analysis of mineral waters which will make our American waters available to more general medical use, and unless the methods of chemistry can be so improved as to afford such analyses, we shall be compelled to await the long and tiresome clinical investigations of each separate spring, upon which the merits of the European spas have been established. If chemists can show us a way by which their analyses may be made intelligible to well educated medical men or to themselves, we shall at once have available all that is necessary to add a powerful factor to our therapy; but so long as chemical expression is so confusing and so inaccurate, our valuable knowledge of mineral waters must be purely empirical and gathered very slowly.

It is possible for the chemist, in the present state of the science, and with the means now understood, to pretty safely determine the acids and the bases of a mineral water, but the combinations of such chemical elements is now purely, or largely, hypothetical and unreliable.

It must be rather disconcerting to those who rail at crounotherapy as being unscientific, to realize that the only scientific feature to it is the one feature which defeats its utility.

I have taken mineral waters containing (hypothetically, according to the analysis) considerable magnesium and sodium sulphates, and have administered them to patients with the expectation of finding them laxative in action, and have found that they exhibited no such effect. The presence of considerable calcium in the water together with the absence of laxative effect induced me to feel that the sulphate of calcium was as prominent an ingredient as the sulphates of the other salts.

* Mason, "Water Analyses."

The analyses of the waters of Waukesha, made by various chemists, show practically the same quantity of mineral matter to the gallon; the physiological action of all of the Waukesha waters is the same; and yet the chemical combinations (as shown by the various chemists) differ very markedly.

It is known by the man who has had a moderate education in chemistry, and is acknowledged by the chemist, that waters containing as many basic elements as many of the mineral waters do, offer the greatest difficulty in merely determining these basic elements, and that, when we begin to consider the possible results and combinations from the mixing together of all of these elements, we have a condition of complexity which quite overreaches the possibilities of our present scientific facilities. There is room for such a variety of guesses as to make the guessing too inaccurate for serious consideration.

Various excellent methods of mineral water classification have been devised which would simplify the usage of the mineral waters, and by far the best of these is that of Dr. A. C. Peale*, but since these classifications are based upon the hypothetical and unreliable analyses now existing, their value depreciates in the eyes of the thoughtful crounotherapist.

The state of affairs is not hopeless. Chemists may devise a way of clearly expressing themselves or of more thoroughly analyzing; but whether they do or not, competent medical men are now beginning to study our American waters clinically and are determining facts which cannot be materially affected by the hypothetical statements of the chemist and which will make a real impression upon the therapist who will accept the waters for general use on ample evidence of their worth.

Butler, at Alma, Michigan, Kahlo, at French Lick, Indiana, Anderson, in California, and other such men as Walton and Cook are gathering together unquestioned evidence of the value of the various waters in special cases. The mineral spring resorts are attracting educated and capable medical men who will give to the medical world clinical, working facts in the next few years. Patient toil and study on the part of these men will make our waters available, and I think that I am not alone in believing that, as a result of their efforts, it will not be many years before a knowledge of crounotherapy will be as essential to a broad medical education of the American physician as it is in European countries.

Mineral waters have so much to offer that they deserve careful and thoughtful study and if the chemist fails us, we will learn the secrets of the therapy ourselves, even if we have to lay ourselves open to the charge of being empirical rather than scientific.

* Transactions of the American Climatological Association; Chicago Clinic and Pure Water Journal, January, 1903; Solis-Cohen's "System of Physiologic Therapeutics."

Editorial.

PHYSICAL METHODS IN THE TREATMENT OF SO CALLED CHRONIC DISEASES.

CHRONIC diseases, so called, are in almost every instance associated with the well known condition, local stasis. Acute and sub-acute inflammatory affections which from neglect have been followed by infiltration of the tissues with inflammatory exudates have a tendency to persist and become chronic. The management of such conditions in the past has been the most difficult problem in medicine. To rheumatism, and other so called dyscrasia has been ascribed numerous affections which are in no sense of rheumatic origin. Neuritis, synovitis, sprains, flat-foot, rheumatoid arthritis, and a host of other conditions have been treated with salicylates, iodide of potash, colchicum, and other drugs which are destined to impair digestion and render the individual otherwise uncomfortable without ever affecting the inflammatory processes. Such maladministration of therapeutic measures is calculated to bring discredit and chagrin upon the medical profession. Until it is generally recognized that it is necessary to administer some physical agent for the relief of inflammatory processes which will prevent or induce reabsorption of the inflammatory infiltration and restore normal circulation in the parts, the chronic diseases will furnish food for the quacks and charlatans—the cormorants who prey upon credulous humanity. When the medical profession fully appreciate the significance of energetic local stasis and the means for its relief, the number of patients suffering from chronic diseases will be greatly diminished. Two affections may be named as illustrating the truth of this statement—acute sciatica, and tic douloureux. The average case of either of these conditions, when it presents itself to the medical adviser could be cured within one week and yet, how many of these unfortunate creatures suffer for years or a lifetime, especially with the latter disease! The physician who relies on medicinal measures for the treatment of a case of neuritis makes a grave mistake and manifests an ignorance of the true nature of the disease as well as its proper treatment. The relief of the con-

dition by a scientific administration of electricity is instant and the cure as certain, and yet many sufferers are yearly added to the list of chronic sciaticas and the incurable conditions of neglected tic douloureux.

* * *

ADVANCED THERAPEUTICS.

IT has been a notorious fact in the recent history of the medical profession that those leaders in medical thought who have been unfamiliar with the uses of electricity, light, mechanical vibration, and other physical measures, have shown a disposition to make light of their significance or to ignore them altogether. The teachings of the leading medical colleges of all countries is a verification of this fact. The young medical graduates at the outset, are prejudiced in most instances, particularly against the use of electricity. The disposition of the great medical colleges to ignore these advanced therapeutic measures, for such they can but be considered, are holding back the dissemination of truths which are of inestimable value to humanity. The responsible positions which they occupy and their opportunity for making widely known these important branches of medical science, should cause them at least to investigate thoroughly the truth or falsity of the claims of those who advocate them. The writer discovers in his official capacity as teacher and editor a remarkable turning of the investigating medical minds, not of mediocre men, but of the brightest minds in the profession to the investigation and adoption of physical therapeutic measures, and can forecast from the knowledge and experience of himself and his confrères the early adoption by the mass of the profession of these methods. The demand for their use and the constantly increasing interest and investigation of light, the X-ray, and so-called high frequency by members of the profession who are the leaders in medical thought in every community is a guarantee that the mind of the profession, heretofore prejudiced, is becoming broader. But few indeed of these inquisitors know where to turn for the information they so much require. The teaching in the medical colleges of the country at this time of the uses of exercise, electricity, light, dietetics, hydrotherapy, mechanical vibration and heat scientifically applied, has been of the most meager and superficial

character, while the tendency has been towards the use of drugs and the knife, which seem to dominate.

At this season of the year when the curricula of the medical colleges of the country are being prepared for the coming year it is hoped that more recognition will be given to these subjects, at least by the chairs of "Materia Medica," and they may be induced to give them more attention in the future courses of study. The number of post graduate schools that have been established throughout the country during the last two years which are designed to give instruction in these subjects, is a guarantee of the necessity for this sort of instruction and the number of students who are attending these courses and the interest manifested in the same is an assurance that they will soon be recognized by the medical profession everywhere.

* * *

MEMBERSHIP IN THE AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION.

PHYSICIANS desiring to become members of the American Electro-Therapeutic Association, may do so by signing an application and paying the fee of five dollars. Action is now taken upon the admission of members by correspondence in intervals between the meetings. The qualifications for membership are that the physician shall be in good standing, recommended by two members of the association and eligible to membership in the American Medical Association—*i. e.*, membership in good standing, in an association in affiliation with the American Medical Association. Upon application, the editor of the JOURNAL will send blanks and other particulars. The official organ is sent gratis to all members of the Association *in good standing, and the annual dues are five dollars per year.*

* * *

THE ANNUAL MEETING OF THE AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION.

THE next annual meeting of the American Electro-Therapeutic Association will be held at St. Louis, Mo., on Tuesday, Wednesday, Thursday and Friday, September, 13th, 14th, 15th, and 16th, 1904.

The sessions of the Association this year will be held in an assembly room in the Inside Inn and favorable arrangements have been made by the committee of arrangements, for guests at the same hotel. The terms will be \$1.50 per day and up for rooms.

Progress in Physical Therapeutics.

GYNECOLOGY AND APPLIED METALLIC ELECTROLYSIS.

BY G. BETTON MASSEY, M. D., PHILADELPHIA, PA.

The Future of Electro-chemical Surgery.

The editor of this department is so lacking in prophetic inspiration as to be uncertain of the ultimate results of the present "boom"—to use an Americanism—in the employment of currents of high pressure and small volume in electro-therapeutics. He understands that some thousands of static machines have been recently sold to physicians, while the old-fashioned manufacturers of "galvanic" batteries are facing extinction.

It is evident to some of us who are not new in this work that either one of two results will follow this interesting and important revival of interest in electro-therapeutics, though it is difficult to say which of the two will be paramount. Either interest will flag in electro-therapeutics as a whole when the limitations of static electricity and its transformations are better understood; or the users of this modality will be so highly appreciative of its true value as well as its limitations that they will desire to extend their field of usefulness by adding an up-to-date technic in electro-chemical surgery to their armament.

It is to be hoped that the latter result will follow this widespread interest in one form of electric currents, and that the direct surgical applications of electric force as foreshadowed by Erb, Althouse, De Watteville and Apostoli, will be studied anew, with the newer light cast on the true nature and behavior of electrons by Arrhenius and Van't Hoff, the Swedish and Dutch students of modern electro-chemistry. The old battery makers may be left to their fate if we but possess a good controller, an accurate meter of low internal resistance, and either access to constant current mains or an adequate battery of large sized Columbia dry cells. Last, but not least, we must possess the technic and boldness of the surgeon (and this designation is not pre-empted by the mere lovers of the knife) combined with the electro-technical knowledge of at least the poorest electrical engineer.

Dr. McFadden Gaston's Method for the Cataphoric Sterilization of Malignant Growths.

Continuing the original work of his lamented father, Dr. J. McFadden Gaston, Jr., of Atlanta, publishes some interesting results in the *International Journal of Surgery* for January, 1904. It will be remembered that Dr.

Gaston, Sr.'s observations led him to attach great value to the administration of Donovan's solution (liquor hydrargyri et arsenii iodidi) both by mouth and by cataphoric diffusion into the growth. The paper under review gives interesting accounts of several patients either cured or benefited by the method, with a further favorable report of the continued good health of a patient operated on by the method in 1896 by the elder McFadden Gaston and himself. This patient suffered from an inoperable sarcoma of the abdominal wall, and was cured after a prolonged treatment. The technic employed is described in the following paragraph:

"A sponge or pledget of absorbent cotton is all that is needed for the positive pole in most instances. An ordinary sewing needle is well adapted for the negative pole. No elaborate apparatus is comparable to a simple plunge battery containing zinc and carbon plates immersed in a solution of bichromate of potash and sulphuric acid. For the positive pole use an amalgamated metal, either zinc or alloy, to which the pledget containing the Donovan's solution is attached, the solution being decomposed by the current, setting free the mercury and arsenic, which are diffused into the growth." The negative needle or needles are inserted near the periphery, while the active electrode is held against the growth itself.

Dr. Gaston's purpose is to employ a small current, repeatedly, but as no mention is made of a meter being employed in this particular form of application it is likely that a considerable current would result, even from a few acid cells, with one pole inserted into the growth and the other resting on an ulcerated or denuded area. Elsewhere, mention is made of 75 to 100 milliamperes being employed, monopolar, in intra-uterine applications of cataphoresis.

The results reported prove the considerable value of mercury and arsenic ionized and diffused in this manner. The editor's personal experience in the use of cataphoresis, has, nevertheless, taught the great value of direct penetration by the zinc-mercury electrode, particularly with minor applications, as the broader surface presented by the pledgets minimizes the action of a few milliamperes, and much of the cataphoric action is wasted on the cotton or sponge covering; (if sponge is employed in contact with the growth itself it should, of course, be renewed at each application as carefully as the cotton). If a solution of mercury and arsenic adds value to the soluble zinc-mercury electrode there is no need of any kind of covering, as a rule, for the surgeon has the choice of merely supplying the liquid to the point of application from a pipette from time to time, if the point of application is horizontal, or else injecting it freely into the tumor near the electrode. The action of the current will carry the ions of both metals into the growth simultaneously, and though the amount of mercury

in Donovan's solution would be insignificant compared with that supplied from the amalgamated surface of the electrode in the method developed by the editor, the addition of the arsenic may be of great value.

The one point that the editor of this department regards as unwise in Dr. Gaston's method is the making of a possibly septic wound in the edge of the growth by the negative needle instead of having this pole spread out on the back or some other indifferent surface. It is best to make no wound in a malignant growth unless the whole neighborhood of the wound is impregnated with ionized mercury. Whether the whole growth is overwhelmed at once, under an anæsthetic, or in divided doses, depends on the degree of malignancy, the less virulent cases only permitting the slower method.

Methods of Application of High-Frequency Currents, by Clarence A. Wright, F. R. C. S., in the Journal of Medical Electrology and Radiology, is a series of articles beginning with the February number. The various modes of treatment and classes of diseases most benefited include gastric dilatation, constipation, neuritis, bronchial asthma, lightning pains of locomotor ataxia, muscular cramp, rheumatism, specific arthritis, synovitis. It is a most interesting series and much valuable information will be gained by their perusal.

CURRENTS OF HIGH FREQUENCY AND HIGH POTENTIAL.

EDITED BY WALTER H. WHITE, M. D.

High-Frequency Currents in the Treatment of Skin Diseases.

By Chas. W. Allen, M. D., Professor of Dermatology
Post-Graduate Medical School. Medical Record, February
20, 1904.

An interesting article discussing the nature of high frequency: "1. What are high-frequency currents? 2. How are they produced? 3. How are they applied? 4. How is their action accomplished? 5. Of what value are they to dermatology?"

He reports 175 cases of various skin diseases treated since November, 1901. "In chronic eczema he has found the discharges of vacuum electrodes of decided value in alleviating symptoms and in diminishing infiltration." "In zoster of the thigh and arm with hyperæsthesia and neuralgic pain, not only has temporary relief been afforded immediately after each application, but the whole course of the disease has been shortened and the lesions have healed more promptly than without their use."

"General effluvia with metallic pointed electrode giving what I call 'feather duster' brush seems to diminish the

pruritus, to shorten the individual attack and decrease the entire course in subacute or persistently recurring urticaria." "In conclusion, I can state that high-frequency currents are of decided advantage to those treating skin diseases, but are especially to be employed in connection with other measures. They are curative of themselves in a restricted class of cases. They aid in relieving symptoms in a larger class, viz., those attended with pruritus. As a whole high-frequency currents are inferior to the X-ray in skin work, but the two go well together."

LARYNGOLOGY, RHINOLOGY, AND OTOLOGY.

Mortality of Diphtheria in Private Practice under the Antitoxin Treatment.

The benefit of the antitoxin treatment in diphtheria is now so generally admitted that the great decrease in its mortality, as shown by Dr. John Zahorsky (Medical News, New York, December 5; Jour. Am. Med. Assn., December 19, 1903), is not surprising. He has studied the mortality statistics of diphtheria with the antitoxin treatment and has obtained data from about a dozen leading physicians in St. Louis who have employed it in their practice with children with surprising results—only 1.5 per cent. mortality in 1610 cases. This includes the laryngeal cases, many of which were intubated. There are possibly certain errors such as the non-recognition of the disease in time, the use of insufficient dose of antitoxin, the inefficient character of the serum, and mistaken diagnosis, accounting for the occasional deaths. One of the physicians thinks no patient with diphtheria should die. Zahorsky believes the statistics are not singular, but can be duplicated anywhere by physicians who believe in antitoxin and know how to use it.

Tobacco Deafness.

The influence of tobacco on the eye is generally understood, but its deteriorating effect on the ears is not so well recognized, so that the article of Dr. W. Wingrave on this subject (Medical Press and Circular; American Medicine, December 5, 1903) is very opportune. He divides the deafness from smoking into three groups—mechanical or pneumatic, irritative or catarrhal, toxic or nerve deafness. The mechanical form arises from smoking a tightly-packed pipe, cigar, or, cigarette, especially in those with nasal obstruction. Negative pressure is thus exerted, causing hyperæmia of the eustachian tubes. The chemic and mechanical irritation of the smoke causes the catarrhal form. The toxin is cumulative since complete abstinence is essential to permanent improve-

ment. Deficiency of appreciation of low tones in fifty per cent. of cases is presumptive evidence in favor of selective degeneration in the auditory as in the optic nerves. Treatment consists in complete abstinence from tobacco, with the administration of strychnia.

New Method of Treatment of Suppurative Otitis Media.

After ordinary cleansing, Dr. Ehrenfried (Deutsche Medicinische Wochenschrift; American Medicine, December 5, 1903) places the patient in a horizontal position with the ear up, and permits a weak solution of lysol to run into the ear; this diffuses itself through the ear passages, and softening the pus and cholesterin in from 10 to 15 minutes. He then inserts a pipette (the bulb of which has been emptied by compression) as far as possible into the middle ear, and by suction dries the cavity, repeating the procedure until he is satisfied that no fluid remains, then repeats the lysol injection. He sometimes injects the fluid 3 to 5 times. He reports good results, stating that ears are cleansed of large masses of hidden, stringy pus plugs, in one or two sittings. In his opinion many operations are prevented by this method. In fact, he never operates, unless threatening symptoms of meningitis or pyæmia existed, secondary abscesses diagnosed, or the external meatus so narrow as to prevent all effectual treatment.

Special Influences of the High Altitudes on the Nose and Throat.

It is a matter of common observation that patients accustomed to living at the sea level, on reaching higher altitudes suffer from nasal symptoms which were not observed before. In discussing this subject before the Section on Laryngology and Otology at the last meeting of the American Medical Association (Journal Amer. Med. Assn., November 14, 1903), Dr. S. Edwin Solly explains this as being due, in the first place, to the altitude which causes a marked reduction of atmospheric pressure on all parts of the body, and consequently a greater fullness of the blood-vessels of the skin and of the mucous membranes which are exposed to the air. As a result, there is a physiologic congestion of the blood-vessels of the nasal cavities, especially of the erectile tissue of the turbinate bodies. Under these conditions it often happens that when a person is transported from sea level to a high altitude, in whom there exists some narrowing of the nasal passages, due to the presence of a septal deflection or spur, or to an hypertrophied turbinate, or a neoplasm, that the increase of the stenosis caused by this physiologic engorgement of the proximate tissues makes him conscious of a nasal deficiency, of which he may have been previously entirely ignorant.

This person then feels his nose stopped up and perhaps suffers also from the induced nasal pressure and so passes under the observation of the rhinologist.

From his experience and observation Dr. Solly concludes as follows: Surgical measures are often demanded at an altitude in cases which had previously gotten along comfortably without it at sea level.

The results of such procedure are at least as satisfactory as elsewhere, but more than usual care must be taken to save all secreting tissue.

The local symptoms of atrophic rhinitis are aggravated, though the constitutional conditions are often markedly improved. The moist form of hypertrophic rhinitis is much improved.

In disease of the accessory sinuses, if the appropriate relief is given, the affected surfaces dry up and heal more rapidly and surely than at sea level. In this respect the result is the same as is well known to be the case in the healing of other wounds and ulcerations.

The Electric Eustachian Bougie.

The recent report of a number of cases of treatment of deafness by means of the electric bougie has again brought this electro-therapeutic to the fore. The necessity of a careful selection of the cases suitable for this treatment is well illustrated by the report of Dr. H. Bosworth Crocker (California Medical Journal, October), who states that in fourteen cases of tubal deafness treated by this method, each case receiving 10 to 20 treatments, only two were benefited to any appreciable extent.

The following is the method by which the treatment was applied:

The nostril is at first sprayed with a cleansing solution, followed by 5 per cent. solution of cocaine. After ten minutes a pledget of cotton is saturated with a 20 per cent. solution of the anæsthetic and is held against the eustachian orifice until sensation is abolished. The silver catheter, previously wound to near the tip with an insulating rubber strip, is next introduced in the usual manner, and the bougie is passed from the end. A current, gradually increased to not more than five volts, is connected with the bougie at the negative electrode and the other pole is in contact at the mastoid. The bougie is slowly passed until the tympanum is reached, and then withdrawn and the process repeated with a larger size.

Crocker believes that the electrolytic method is best for dissolving strictures, and that it should not be used in simple catarrhal stenosis when the cure can be effected by inflation and medication of the tube by the methods already in vogue.

GENITO-URINARY DISEASES.

Aids to Cystoscopic Practice. By F. C. Valentine, N. Y. Medical Journal, June 6.

This paper is a description of a new apparatus, which the author calls a box-phantom in order to familiarize the appearances of the bladder in health and disease. Another manikin he has constructed for physicians who want a phantom for advanced study. There is a necessity to make studies in these ways, in order to be more expert in cystoscopy and prevent delay and disappointment in examining patients.

Torsion of the Testicle. By W. W. Williams, N. Y. Medical Journal, June 6.

This interesting case is reported in detail. The patient was a young man aged 16 years, who presented himself with a severe pain in the right groin and testis. On examination a diagnosis was made of a rupture, which was reduced. At the same time an epididymitis existed, which was turned toward the front and enlarged. After the reduction the patient felt better. A few days after a similar attack occurred, and manipulation failed to give any relief. A fluid of serum and blood appeared from the cord after an incision. The torsion of the testicle was such that the testicle and cord were darkened in color, from the strangulation. Then the operator ligated the cord and removed the testicle. An ounce of coagulated blood, black in color, was let out from the testicle. The wound was closed and the stitches removed on the seventh day. The patient has been well since that operation and has had no more pain.

Vesical Appearances in Renal Suppuration. Edgar Garcean, Boston Med. and Surg. Jour., January 15.

If the pus is seen coming from the ureter of the corresponding kidney, it is a positive diagnosis, while not perceiving to see the pus at an ocular inspection does not prove the contrary.

Does Newman's Galvano-Cautery Sound Necessarily Cauterize. Robert Newman, The Electro-Therapeutists, January, 1903.

The galvano-cautery sound has been used very seldom, gives flashes of electricity, has never been used to cauterize or to destroy tissues, but as a stimulation to a diseased prostate.

Some Notes on Pollacci's New Method of Detecting Albumin in the Urine. Gordon Lindsay and William J. Giles, Amer. Medicine, Phila., January 31.

The original description of this method appeared in the Schweizerische Wochenschrift für Chemie und Pharmacie (1901, xl, p. 168). The formula is given as follows:

- A. 1 gram tartaric acid
 5 grams mercuric chlorid } dissolved in 100 c.c. water.
 10 grams sodium chlorid }
 B. Solution A + 5 c.c. formaldehyde (40 per cent. solution).

Solution B. is used for the detection of albumin as in Heller's test, care being to stratify the solutions and prevent their admixture. Should a white zone appear at the line of contact of the two fluids the urine contains pathologic albumin. Pollacci claims that this is more delicate and sensitive than the Spiegler reagent or than other methods. Lindsay and Gies have examined this method and conclude as follows:

1. Pollacci's reagent readily precipitates various proteids—simple, compound, and abuminoid.
2. The test is too delicate for ordinary clinical purposes, since the normally occurring urinary proteids are precipitated by the reagent.
3. Various nonproteid substances occurring in the urine in health and disease are probably also precipitated by the reagent.
4. The latter possesses little or no advantage over Spiegler's fluid.

Gonorrhea in the Male. F. R. Millard, California, Charlotte Med. Journ., January, 1903.

This is a report from a general practitioner, who instructs his patients in the technique of injections and irrigations, and sees that his orders are carried out correctly. Such supervision is very important and adds to the success of the practitioner. The article is well worth perusing and will be beneficial if hints therein are followed.

RADIOTHERAPY.

EDITED BY J. D. GIBSON, M. D.

X-Ray, Light, and High-Frequency Electricity. By R. H. Boggs, M. D. Pennsylvania Medical Journal for January, 1904.

In the first part of the paper the writer discusses to a considerable extent the physics of phototherapy, treating this still unfathomed subject in a very intelligent manner. The posi-

tion which he takes in advocating the judicious use of the different forms of light is very timely and appropriate at this time when many physicians are attempting to use them without any previous preparation except the purchase of some form of apparatus. Such are generally woefully disappointed when they cannot get the results expected. The doctor maintains that the X-ray does not increase metastasis, but that in cases in which this condition does occur it was due to the fact that treatment was instituted too late in the progress of the disease. On the other hand, he maintains that in very many cases its occurrence has been prevented. He reports 28 cases of tuberculosis treated. Of two cases of ulcerated tuberculosis of the larynx, one was healed and the other is improving. Five cases of tubercular joints were treated—three cured, one improved, and one gave up the treatment. Of thirteen cases of pulmonary tuberculosis, two were apparently cured and treatment discontinued; seven improved and four died, two of whom were so weak that they were only able to come over a few times, another gained eight pounds in two months when she began having trouble with her throat from which time she gradually grew worse. Another improved—night sweats, and cough were relieved, for which she gave credit to some trivial home remedies, quit treatment and followed the advice of an advertising physician and died a short time afterwards. Five cases of tuberculosis of the glands were treated, three of which were apparently cured and the other two improved. Three cases of tubercular muscles were all healed. The doctor reports several cases of malignant diseases in which the usual effects were obtained as when used in a competent manner.

Utility of the X-Ray. By Dr. S. H. Heller. Pennsylvania Medical Journal.

The writer reports some interesting results in the treatment of tubercular and malignant conditions. Six cases of carcinoma are reported as yielding promptly to treatment and are now well. Most of the cases of epithelioma treated also yielding promptly with six permanent cures. He reports most satisfactory results in the treatment of lupus, eczema, and also one case of rhus poisoning, in the latter of which three exposures effected a cure.

The X-Rays and Ultra Violet Rays in the Treatment of Tuberculosis. By J. B. Ransom, M. D. Medical Record, February 27, 1904.

The writer reports forty cases of tuberculosis treated, eight cases, or twenty per cent. were cured, seventy-five per cent. improved and five per cent. discontinued treatment. The first six cases reported of abscess of the apex of the lungs were

healed promptly under the ray after all other means of treatment had failed. Five others of tuberculosis of the sternum healed promptly under the ray after resisting all other treatment surgical and otherwise. He reports also cases of caries of the metatarsal bones of the great toes, and caries of submaxillary bone. Two cases of extensive caries of the foot, leg and arm which were about to be amputated were all saved through the efficacy of the ray. One case of tubercular condition of the rectum, with many deep and callous fissures were all healed and cured by the ray after failure of all other methods. Cases of tuberculosis of the scrotum and elbow-joint and ends of the bones were also cured. One case of tubercular tumor of the abdomen disappeared under treatment. Ten cases of aggravated tubercular glands of the axilla and cervical regions were all cured or progressing to a favorable termination. One case of tubercular infection following gunshot wound of the lung was healed after everything else had failed. Eight cases of chronic tubercular pleurisy were all improved and discharged from treatment. Six cases of pulmonary tuberculosis under treatment are all doing well, and two cases of far advanced tuberculosis who could not stand the exertion were obliged to give up treatment. This is an encouraging report, and coming from so accomplished a surgeon as Dr. Ransom, with his broad scope of present work and large experience, adds additional importance to the facts contained therein.

HYDROTHERAPY.

EDITED BY CURRAN POPE, M. D.

The Hot Full Bath. By Friedrich Grosse, Medical Record, New York, February 27.

The hot full bath is here defined by Grosse as a bath above 100 or 200 F. It should cover the whole body to the jugular fossa, and the temperature should be 107 to 109. The patient should enter it slowly so that one or two minutes elapse before he is fully immersed. He should make no unnecessary movements to increase the sensation of heat, and Grosse does not favor the long duration bath. He has never given it higher than 108 or extended the time beyond eight minutes. There is no danger of catching cold after this bath so long as the patient returns within a quarter to half hour to shelter where he cannot catch cold. The dieresis is increased. There is anæmia of the internal parts with dilatation of the arterioles. The heart action is accelerated. When the duration is short, the bath acts as a stimulant to the heart, but if too long continued, it may induce heart failure. Its action is based: 1, On

powerful stimulation of the entire nervous system for a brief period; 2, an intense revulsion of circulation tending to hyperemsize the skin and unburden inner organs; 3, perspiration more abundant than after any other form of bath; 4, a raising of metabolism, and 5, the creation of a sometimes valuable leucocytosis. It is indicated, therefore, whenever we want to incite energetically the metabolism or create a "curative fever," and when there are toxic substances to be eliminated by a perspiration and we wish to remove exudations and stagnations in the internal organs, and lastly, when we wish to energetically incite the entire vital cell activity. It is contra-indicated in myocarditis, heart disease, marasmus, when there are fetid masses in the intestines, in case of pus collection anywhere in the body, and whenever, by thickening of the secretions, pus could be retained, as in otitis media, epididymitis, etc., and in all highly febrile conditions. As special indications, he mentions all maladies of the upper air passages, lung troubles, syphilis, some ophthalmic disorders, neuritis and neuralgia. While some authorities consider the hot bath contra-indicated in central nervous disease, some more recent neurologists have shown good effects, as in myelitis lumbodorsalis, hemiplegia, progressive pseudoparalysis, etc. Once in a case of locomotor ataxia he advised it, and had trouble in stopping the treatment, as the patient was inclined to overdo. It has also been recommended in some of the infectious diseases, in incipient influenza, infantile convulsions, colic, etc. He suggests the name "Baelz" for the bath, as corresponding with the terms Brand Bath and the Ziemssen bath (Jour, A. M. A., March 12, 1904).

Myxoneurosis Intestinalis Membranacea. By C. A. Ewald, American Medicine, Philadelphia, February 13.

This is the name given by Ewald to a nervous intestinal affection, characterized by mucous discharge. Closely allied to it is another clinical type, colica mucosa, with griping pains. In both cases the stools, aside from small masses of fecal matter, are composed almost entirely of mucous masses. There are other nervous symptoms, intermittent colicky pain, sometimes bladder symptoms and stubborn constipation. The indications for treatment are to empty the bowels without the use of strong and especially without saline agents, the relief of pain without the use of narcotics, and to obviate the sequels of constipation, such as gas formation, dyspeptic symptoms, and auto-intoxication. He advises the injection of oil and vegetable laxatives, such as senna, castor oil, flaxseed, etc., and proper diet regulation, the use of coarse breads and coarse vegetables, fruit juices, etc. Most of the dietetic measures are known to the laity, who try the various systems on themselves.

Where these are not sufficient, he thinks it well to use mineral water, massage, electricity, room gymnastics, hydro-therapeutics, especially the Scotch douche, or alternating of cold and hot douches. In cases of spastic constipation, the coarse diet may be contra-indicated, and opium and belladonna internally, or in combination as suppositories, and oil injections work well. A mild, non-irritating diet should be instituted. He suggests the following diet scheme when constipation does not exist; breakfast: sweet milk, cocoa, oatmeal with cocoa, white or dark bread, with honey, jam, or fresh fruit. Dinner (preferably at midday): Vegetables or fruit, as apples, plums, blueberries, raspberries, cherries, a broth or vegetable soup, spinach, tomato or beet soup, a milk soup or curded milk, butter, and a liberal amount of fresh vegetables are desirable, or pea, rice, or lentil soup, stewed vegetables with dumpling, macaroni puddings, blanchmange with fruit juices, etc.; salads and eggs variously prepared, bread with butter, and a light cheese. Supper: A thick soup, made with barley, rice, tapioca, etc., baked potatoes, eggs, bread, butter, cheese milk, etc., (Jour. A. M. A., February, 7, 1904).

The Hoglauer Wave and Spring Baths. By E. Meyer (Berlin). Ueber Erfahrungen mit den Hoglauer'schen Wellen und Quellbädern. Berliner klinische Wochenschrift. Artificial Wave and Spring Baths.—Hoglauer of Munich has devised a system of waves in the bath waters, produced by the action of a wheel driven by electricity. Meyer has been trying these new wave and spring baths, as they are called, in the hydro-therapeutic treatment of neurasthenic and obese subjects and those with constipation on a nervous basis. The influence of the gentle massage induced by the commotion of the water had an unmistakable favorable action. Patients with rheumatic pains were also benefited by them. The water is forced up through a dozen openings in the double bottom of the tub for the spring baths. Both forms are illustrated (Jour. A. M. A., February 20, 1904).

PSYCHO-THERAPY.

EDITED BY LESLIE MEACHAM, M. D.

"Suggestive Therapeutics." Horatio S. Brewer, M. D., Burlington, Wis., Medical Brief, April.

Dr. Brewer asserts that the influence of the subjective mind for ill or good is the cause and cure of all diseases. Vaccination and diphtheria antitoxin act through influence on the patient's mind. The thought of their age kills old men. Cancers kill because thought to be incurable, and the author has

cured many with rain water. He says that he has relieved every case and cured a great many without drugs. The subjective subliminal self once influenced can throw off all morbid process. The power of driving out harmful thoughts by better ones is infallible, and its therapeutic value in disease does away with so much drugging. No disease is ever cured by drugs. All diseases are cured by suggestion. Doctors are a necessity only, when they understand the power of suggestion. They are a peril to any community when they fail to grasp the influence of suggestion.

[While there is an undercurrent of truth in the above statements, there is so much exaggeration and ignoring of bacteriology and pathology as to prejudice many against accepting any part of the principles. Many cases of hysteria are improperly diagnosed as epilepsy. Many cases of epilepsy are complicated with hysteria. The whole article shows the bad effects of making deductions from insufficient data, and the necessity of comparing experiences with fellow practitioners, in order to reach safe conservative conclusions.—EDITOR.]

"Diabetes Mellitus Cured by Hypnotic Suggestion." John D. Quackenbos, M. D., Fellow of the New York Academy of Medicine, etc., New York. Medical Brief, April, 1904.

The author assumes that the cause of diabetes mellitus is error in the metabolic activity of the liver, but in giving suggestions allows for pancreatic involvement.

He gives suggestions to regulate the nervous influence and re-establish glycogenic control. The sleeping patient is urged to correct the perverted nervous function so the carbohydrates be properly assimilated and no excess of sugar be manufactured, and to stimulate the pancreas to supply sufficient ferment to destroy the sugar and convert it into energy. He adds suggestions to control the thirst, craving for sweets, quantity of urine voided and its specific gravity.

The number of cases treated is not given but two are cited. One, a girl of six, was voiding sixty-five ounces of urine daily with a specific gravity of 1038 and six and one-fourth per cent. sugar. Three treatments while the child was asleep at night eliminated the sugar, reduced the quantity to twenty-four ounces daily, and the specific gravity to 1017. The child lived for more than two years in comparatively good health, and died in December last, cause of death not known to the author.

The second case was a farmer of thirty-five, who had glycosuria (particulars not given) and had lost thirty pounds in six weeks. He received seven treatments and has apparently been

in perfect health for the last eighteen months, with normal urine in character and quantity.

[The above cases would seem to call for further experimenting and testimony.—EDITOR.]

CONSTITUTIONAL DISEASES.

EDITED BY FRANCIS B. BISHOP, M. D.

The "Felt" Treatment of Sciatic Neuritis. By John A. Wesinger, M. D., North American Medicine, July 4.

On the morning of January 27 I found the patient suffering from an intense neuritis involving the left sciatic. The pain points were most marked behind the trochanter, in the middle of the thigh, posterior calf, and dorsum of the foot. I resorted to morphia and other anodynes without avail, and on January 31 applied the paquelin cautery over the tract of the nerve with negative results. On February 3 I began daily applications of galvanism with the hot pack. This was continued until February 10, and also gave negative results. By this date the dorsum and sole of the foot had become anæsthetic. On February 11 I began the "Felt" treatment, injecting 2 mg. (1-33 gr.) atropin subcutaneously, four inches above the knee. In fifteen minutes all the well-marked physiologic effects of the drug were noticeable, except dizziness; pulse continued at 120 for about three hours. There were great dryness of the mouth, mydriasis, redness of the skin, hallucinations of sight and hearing, and restlessness. Twenty-four hours after the first dosage the effects of the atropin had subsided, but the sciatic pain was still present. On February 13, forty-eight hours later, I gave the patient a second injection of 2.6 mg. (1.25 gr.) in the same region as before, with a similar result. Twelve hours after this injection the sciatic pain was gone. On February 15 I gave a third and last injection of 3 mg. (120 gr.) atropin. The patient has been absolutely free from pain in the sciatic from the time of the second injection, and is back at his regular work of city mail carrier.

The results obtained in this case would indicate that Dr. Felt has brought to the attention of the profession a valuable mode of treating this most intensely painful and often disastrous malady. All that is required is accuracy of dosage and courage to inject so large a quantity of atropin into the patient, who should first be told all the disagreeable after-effects of the treatment, as otherwise you may not see him a second time.

While it is in order to congratulate the doctor on the success of this case, it is hard to agree with him that he has confined his treatment to the "Felt" method, as he treats with morphia and

anodynes from January 27 to January 31, when he resorts to the paquelin cautery over the tract of the nerve. Galvanism from February 3 to 10, and finally the "Felt" treatment. He used galvanism daily without benefit for about seven days; this is all the doctor gives us. It is hardly fair to galvanism. The electric continuous current, known as galvanism, may be used in so many ways, but of course like everything else there is only one right way, and as the subject of galvanism is dismissed with the mere mention of the fact that it was used so many days and gave negative results, we must still hold faith with our old friend, the continuous current, inasmuch as it has stood the test of many years in cases similar to the one described above, and from past experience one would be justified in believing that it will stand the test for all time when used with judgment and skill. It possesses the further advantage of being a thoroughly safe remedy, and while it requires "accuracy of dosage" it does not require special "courage" for its administration.

When the idiosyncrasy of individuals is considered, together with the powerful and rapid action of atropin, it is hard to conclude that the "Felt" method is altogether safe. What has been called in this paper "marked physiologic effects" produced in fifteen minutes, would, I think, be considered by many marked tonic effects.

It is not the intention of the writer of this review to criticise unkindly, but with the feeling that a good remedy has been slighted, in the report of the case at least, if not in the use of the remedy. And in the interests of electricity and safety, versus atropin and possible damage in the treatment of sciatica, the writer bases his excuse for this review.

Every case of sciatic neuritis is not susceptible to cure by galvanism, but in the absence of pressure or organic lesion the proper use of electricity comes as near being a curative agent as any known remedy.

F. B. B.

NEW AND IMPROVED APPARATUS.

This department is devoted to publishing, with illustrations, drawings, and descriptions, new apparatus, electrodes, etc., for the benefit of those interested in the progressive improvements in armamentaria.

MORTON'S SOLENOID—CONDENSER— RESONATOR.

The apparatus shown in Fig. 1 is the result of experiments which were made by Dr. Morton upon the effects of deriving currents for medical purposes from a helix of insulated wire wound upon each of the Leyden jars of a Holtz induction machine.

The inside coatings of two large Leyden jars are respectively connected with the prime conductors of a static machine (or secondary terminals of an induction coil) between the knobs of which a discharge is passing.

The usual outside coatings of the jars are replaced by coils consisting of a large number of turns of fine copper wire

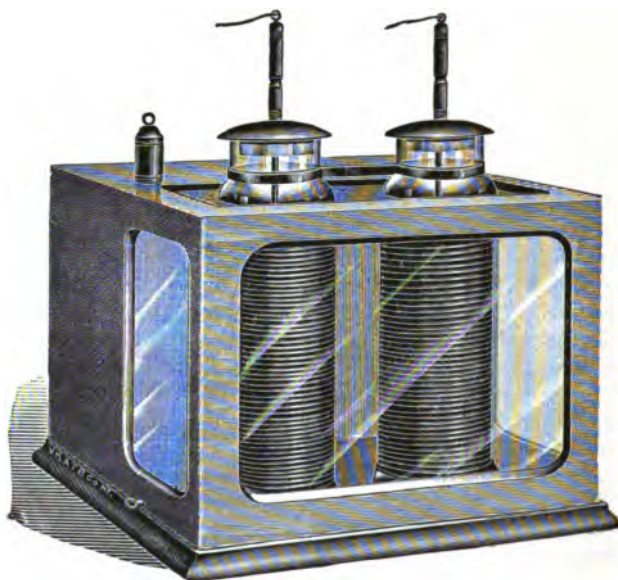


Fig. 1.

wound in series in the manner shown in the diagram, with the turns well insulated and separated to prevent short circuits from one turn to another.

One end of the coils is grounded. From the other end a strong brush discharge issues. The coils act as outside condenser coatings on the jars, in which, therefore, static electrical charges are induced, and also as resonators, the resonator action imparting a very high potential to the high-frequency currents set up in the coils when the static charges in them are set free by the discharge of the inside coatings of the jars across the spark gap, between the discharge knobs of the prime conductors. The effects produced may be augmented by connecting an extra resonator of the ordinary type with the free end of the coils.

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THE EMPLOYMENT OF STATIC ELECTRICITY IN THE TREATMENT OF NERVOUS DISEASES.*

BY WILLIAM BENHAM SNOW, M. D., NEW YORK.

The employment of static electricity in the treatment of nervous diseases is a subject of such scope that in a necessarily brief paper it can only be treated in a general way.

From the earliest history of the therapeutic uses of electricity, its employment has been directed generally to the treatment of diseases of the nervous system. Galvani's first conception when he observed the contraction of the legs of the dead frog under the unknown stimulus was that he had discovered an origin of life, and so it is ever and anon considered by later writers. That electricity is anything, however, but a force capable of inducing certain physical conditions, activities, and changes in matter has not been accepted, and it is doubtful if it will ever be found in its relations to life to be more than an energizing force capable of temporarily supporting and maintaining it. In accordance, however, with the physical laws of this form of energy as exerted upon living tissue when once demonstrated we may rely upon its following established law, for the laws of electrical energy are invariable.

The early observers looked upon electricity from an empirical point of view. At the present time, however, a better knowledge of its physiological actions and effects upon pathological conditions has placed its use in medicine upon a more rational basis and freed it from the place which it occupied in the unfortunate field of empiricism. No therapeutic measure is more positive in its action or more certain when once demonstrated and scientifically applied to the treatment of disease than the various forms of electricity.

The pathological conditions underlying most, if not all,

* Read at the Thirteenth Annual Meeting of the American Electro-Therapeutic Association, at Atlantic City, September 22, 1903.

nervous diseases, are closely allied to some inflammatory process, either active or of a chronic progressive type, which is gradually destroying the structures of organs important to the proper nutrition of the nervous system or directly affecting the organic structures of that system.

The *aetiology* of the forms of nervous disease depends upon numerous and varied conditions of environment, excess, imprudence, and inherited predispositions, but in all cases they result in one of the pathological conditions above referred to.

Environment plays an important part in the causation of nervous disease and is closely allied to the psychic influences which elevate or depress the ego and eventually lead to pathological conditions—a cause far too often overlooked. In addition to physical excesses and irregular habits, environment often induces psychic influences arising from care, anxiety, or, to the contrary, buoyant or elevating influences, which will determine various physical functions, leading to a change in the individual status which will affect the physical condition of the patient.

Reflex causes arising from psychic influences, accident, or other inflammatory process may seriously affect the nervous system, leading to various neuroses. Other cases occur from various diseases of the brain and central nervous system which may arise primarily from one of the preceding causes or as a lesion of the brain or spinal cord.

Conditions arising either from errors of general metabolism, organic disease, or functional derangements may so impair the nutrition of the central nervous system as to induce either functional or organic disease.

Various types of destructive or degenerative changes take place, seriously impairing the functions of the nervous system thus affected. The relief of such conditions to be effective must precede organic or structural change of the neuron or axis cylinder. Other structures of the nervous system are generally capable of regeneration.

Assuming then that the treatment of the nervous system is very largely directed to the improvement of impaired nutrition and the relief of inflammatory conditions which are either directly or reflexly affecting its functions, electric currents of high potential are destined to play an important part in the relief both of local and constitutional conditions.

In this connection the peculiar action of electricity of high potential, especially the static modalities, upon inflammatory conditions is worthy of most careful study.

An electrical modality to be best suited to the improvement of general metabolism must be one of very high potential having great power of penetration and very small current flow; otherwise, its application must be localized. My experience with the currents derived from the high-tension coil, the currents of high frequency as derived from the large Rumkorff coil used for the X-ray, and the static modalities has convinced me that no forms of administration are so safe, potent, and efficient as the latter. The potential from the proper apparatus is sufficient when intelligently administered to influence the deep structures and may also be employed in a manner to favorably affect the most sensitive parts of the organism, of the most fastidious patient.

The action of the static modalities upon inflammatory conditions is to overcome local stasis, increase local metabolism, thereby removing inflammatory exudates and restoring tone and nutrition to local conditions; and at the same time inducing profoundly beneficial effects upon the general physical condition. When electrical currents are administered for a series of treatments in these inflammatory conditions for their action upon some local lesion the general effect of improvement in the condition of the patient is remarkable, especially when the administrations are made with the patient insulated, as when employing the wave-current, sparks, or the brush-discharge.

There are at least three distinct effects produced by this form of energy which contribute to these results, namely, (1) contraction of muscular tissue, (2) polarization, and (3) electrolysis.

Contraction of muscular tissue, in response to nerve stimulation, by an electrical current is induced in the form of both mass and fibrillary contractions of muscular structure, deep or superficial. These contractions are most pronounced when the application is made to the motor points or when currents of great potential are employed. It is this action upon muscular structures through the medium of the reflex nervous system which contributes so largely to the effect of the electrical currents upon inflammatory conditions, inducing contractions of

the body of the muscle, thereby expressing, as it were, the sanguineous fluids from an inflammatory area. At the same time, the current, if of a penetrating quality as are the currents of high potential, locally induces the contraction of the muscular coats of the circulatory apparatus. This two-fold effect overcomes local stasis and at the same time increases the local metabolism.

Another effect of systematic local muscular contraction and relaxation is the induction of the local exercise of the parts which when judiciously applied promotes the re-establishment of functional activity through the actions of the spinal centers independent of the functions of the brain.

When electricity is employed with properly applied rhythmical and distinct interruptions, appreciable vibrations are induced which exert a powerful influence over local and general metabolism.

For the largest measure of these effects which so favorably affect inflammatory conditions when deeply seated or involving extensive areas, the currents of great potential are requisite.

Polarization, as it takes place, like end-organ metabolism, in living tissue, can be but relatively understood. That it exists, however, must be accepted. It is generally believed that, under the condition of electrical charge where one polarity is employed, the cells of protoplasm are disposed to take spherical forms. If, then, oscillatory or interrupted currents are employed, a degree of activity is induced which accounts for the general nutritional effects of high-potential currents. In other words, such currents as the static wave-current which surge to and fro from the electrode in every direction to the periphery of the patient and back with every charge and subsequent discharge do probably from this action materially affect the functional activities.

Electrolysis is another action of importance in the employment of electrical currents of large amperage when applied to the treatment of local conditions. With the static current of high potential and very small current flow the electrolytic and phoretic actions are insignificant.

It will be readily seen from the preceding that the high-potential currents are well adapted to the treatment of the functional and organic neuroses. We believe that the absence of a means of coping with chronic and deep-seated inflamma-

tory processes has induced a degree of neglect of these conditions in the management and treatment of nervous disease. As before stated, there are few of the nervous diseases that are not distinctively or closely associated with inflammatory processes. Neuritis, pachymeningitis, myelitis, anterior poliomyelitis, and tabes are examples of inflammatory processes, and the results in the treatment of these processes certainly offer great assurance for the future treatment of diseases of the nervous system. The impotent position of the majority of physicians, and we regret to say of neurologists, who rely upon drugs in the treatment of neuritis is to be deplored. No one better realizes than those to whom I am speaking the great success obtained from the use of electricity in these conditions. In the writer's own experience, the static modalities are invariably successful in all cases of uncomplicated neuritis. Cases associated with exostoses and malignant, tubercular, or suppurating processes invariably fail to yield to such treatment. In more than one hundred cases, but three which were associated with Pott's disease inducing a pelvic neuritis were not cured. Twenty cases of acute sciatic neuritis of not more than two weeks' standing have been cured within a period of two weeks by the use chiefly of the wave-current, applied over the most common site of the lesion—the exit of the nerve at the sacro-sciatic notch. It is our custom to place the electrode over that site, commencing with as long a spark-gap as will be borne, and increasing it gradually as the parts become more tolerant for twenty minutes. Following this administration, sparks are applied mainly to the same region and along the course of the affected nerve. The same rule applies in the treatment of all cases of acute neuritis and the results are uniformly successful. In the chronic cases, however, the sparks will be the main reliance and should be applied chiefly to the region of the neuritis, which always corresponds to the place where the sparks cause most pain. The distribution, however, should also receive a liberal treatment by the same modality as they will have suffered much from malnutrition during the course of the inflammatory process.

In the treatment of *tic douloureux*, the brush-discharge associated with the wave-current is of considerable value. Success has not been obtained by the writer from the static modalities in chronic cases of this distressing affection. Two

formidable cases of less than two weeks' standing in which the increasing suffering indicated a very active process have been cured within two weeks, the relief from the first treatment being very marked; followed by progressive improvement. These cases call for the administration of the wave-current the brush-discharge twice daily for the first few days, to be followed by daily treatments until the cure is complete.

Chronic cases of tic douloureux, in the writer's experience, have yielded to the administrations of the X-ray which may prove equally efficacious in the acute cases.

The treatment of anterior-poliomyelitis by the employment of static electricity is one of the greatest successes of modern electro-therapeutics and is, we regret to say, hardly appreciated at this time. Cases to be benefited by this treatment should come under observation within the first two months before degenerative changes have already taken place in the neurons. With the latter cases, the prognosis is uniformly bad by any method known to the writer. Seven cases have already come under our observation in which the results have been very satisfactory, the degree of improvement always being relative to the length of the interval between the onset of the trouble and the presentation of the case for treatment. One patient who had made no improvement for two weeks has been restored. In this case the paralysis was general, affecting all of the extremities, and the result about perfect, slight atrophy of but few muscles remaining. Another case in which no improvement had taken place in a patient in whom both lower extremities were completely paralyzed rapidly improved with the first treatment and has progressively improved until now there is slight disability in the use of either limb.

In the other cases, the paralysis has been in but one limb and the results have been uniformly the same as in the preceding cases. The method of treating these patients has been the application of soft metal electrodes over the region of the cord corresponding to the parts affected, employing the wave-current with an extremely long spark-gap, all that can be borne, which will depend upon the width and length of the electrode and the underlying tissues of the little patient. In a child four years old I have used uniformly a spark-gap of five inches with an electrode one and three-quarters inches in width by eight inches in length. Whenever it is possible to

employ sparks with these patients, it is desirable, as the impaired local nutrition of the parts corresponding to the affected region is generally benefited by such applications. It is not necessary, however, to apply sparks in the early days of the treatment as they do not so favorably affect the local hyperæmia and congestion as the wave-current.

In the treatment of tabes, the static modalities have won a most signal triumph in controlling the pain, improving the co-ordination and restoring in a large measure local sensation. In no case in the writer's experience, however, has there been a restoration or improvement in the response of the reflexes or the Argyll-Robertson pupil. The success with these cases depends largely upon the faithfulness with which the patients attend to their treatments and the thoroughness with which the administrations are given. We rely upon the wave-current, sparks, and friction sparks for success in most of these cases. The improvement in many instances in co-ordination and sensibility is positive evidence of restoration of the functions of the neurons either by improvement of nutrition or relief of pressure due to congestion, or both. The greater measure of relief, we believe, however, is due to the relief of the local congestion. Of fifteen cases treated by the writer, the improvement in every instance has been marked, the ultimate result depending upon the faithfulness with which the treatment has been followed. Many cases have passed from observation and the continuance of the improvement cannot be reported, but in seven cases there has been no relapse and the improvement has been permanent, indicating at least that the process has been brought to a *statu quo*.

The favorable results in these cases in which a congestive or hyperæmic inflammatory process is present leads to the supposition that in all cases, except those arising from the presence of some germ, remarkable results from the employment of the high-potential electric modalities may be obtained.

The functional neuroses arise usually from conditions associated with impaired nutrition or local inflammatory processes. The conditions, therefore, in these cases indicate the employment of the static modalities for their effects upon nutrition and locally for the relief of the inflammatory processes. The promptness with which the neurasthenic suffer-

ing from a chronic prostatitis or a spasmodic dysmenorrhea is relieved by the local applications of the wave-current are most gratifying. In all neuroses, a great degree of improvement is derived from the effect of the high-potential modalities upon local and general metabolism. This is demonstrated by the rapid improvement which follows the resumption of the activity of the secretions. It is a notable fact that in most neurasthenics most, if not all, of the secretions are inactive.

This is particularly true of the sweat glands, these glands not responding as normally until after several administrations. In these cases it is not until the secretion becomes active that much improvement is apparent, but it seems from the increase in appetite and other indications of improvement that the activity of other functions is restored coincidently with the activity of these glands.

In one case under observation,—a patient suffering from neurasthenia, a patient who was a sufferer from habitual constipation and dysmenorrhea,—there was no perceptible perspiration until after four months' treatment. The use of the rectal electrode employing the wave-current was instituted for the treatment of constipation when after one month of this treatment she menstruated without pain and coincidently there was a resumption of activity in the sweat glands, after which perspiration was present after each application. This circumstance is mentioned to show the relation between the cause of neurasthenia which, in this case, was the dysmenorrhea, and the fact that upon the removal of the cause the other functions become active. In this case, there has been no return of dysmenorrhea for one year, though the patient had suffered regularly for fifteen years, nor of the neurasthenia, which had disappeared at the end of one month's treatment. This case demonstrates the importance of the investigation of the cause in all cases of neurasthenia as well as the remarkable fact that a case of dysmenorrhea may be cured by so simple a procedure. In this case, there was no flexion but an anteversion. It is probable that the persistence of the condition was due to a congestion in the pelvic region, and that the action of the wave-current was to reduce this congestion, remove the spasm of the cervical portion of the uterus, and cure the patient of her neurasthenia.

Similar results have occurred in three cases of prostatitis.

One in a patient sixty-two years of age of five years' standing who was suffering from an aggravated narrowing of the urethra associated with frequent micturition, retention of the urine, and a degree of neurasthenia which verged on melancholia. With no other treatment except with the rectal electrode employing the wave-current, this patient was cured within six weeks and has remained so for three years.

Two cases in young men about thirty years of age, one of four and the other of five years' standing, treated in the same manner have been promptly cured.

The results in these cases are magical, the improvement commencing from the first administration, resulting in a cure within a few weeks though the cases have been of four and five years' standing.

The above report indicates conclusively the importance of attention to the local conditions. Other cases of neurasthenia, hysteria, melancholy, and hypochondriasis in which it has been impossible to locate any special lesion have been satisfactorily treated and cured by the employment of the wave-current alternately over the abdomen and spinal column, at the same time employing an active application of sparks and friction sparks.

These modalities restore a general local metabolism, but should always be employed in connection with a rational régime as to habit, environment, and diet.

The field for the employment of high-potential electricity in nervous diseases will be greatly amplified as its value becomes generally appreciated in connection with the effects referred to.

Discussion.

Dr. A. C. Bayliss expressed the opinion that electricity would affect the nervous system more readily than any other part of the body. A lady was being treated by one of the prominent physicians of his city, and he had been asked to apply electricity. She was completely paralyzed from the hips down, and had also an exophthalmic goiter. She was carried into the office at first, but inside of six months she was able to come in unaided, and in less than a year she was able to go to work again. The patient was treated with the static wave-current, the electrode being applied to the goiter. The goiter was reduced about three-fourths in size, the pulse was

reduced to 100, the œdema of the limbs was diminished, and the patient was restored to condition of comparative health.



Dr. R. J. Nunn said that the papers contained a lesson which we did not seem ready to learn, *i. e.* that nature generalized and man differentiated. He thought that the nearer we generalized the more nearly we arrived at the truth. He was somewhat surprised to find that in the list of subjects before us no mention whatever was made of radium and its use. This, it seemed to him, did not argue well for our desire for progress. The study of the peculiarities and properties of radium seemed to him to give the keynote to the whole of electrical treatment. Radium showed the highest known vibration of what might be called "the ether." The highest known vibration of the ether was just what we wanted to get for treatment. If there was anything curative in electricity it seemed to him to be in the high vibrations, and the higher the vibration the greater the curative property. The paper of Dr. Daniels (published in the May JOURNAL) showed that the Roentgen ray produced certain results which might have been anticipated from the high vibration. Dr. Snow, in his paper, had shown that similar, though not such important results, had followed the use of static electricity. A paper had been presented at the morning session about a high-vibration apparatus, and brought out the same point. He believed that an electric current of any kind, no matter what its source, presented vibrations from a low to a high standard. Some had an excess of high, and some of low vibrations. In the case of mechanical electricity the probability was that there was a lower vibration, and the lower vibrations seemed to him to serve simply as diluents of the higher ones. The lower vibrations burned the tissues; the higher vibrations penetrated them. It was for this reason that at one time it was supposed that electricity did not penetrate at all, but simply passed over the surface. He had had the honor of bringing before this association the account of a case in which he had applied a low-tension current to a woman, one electrode to the sacrum and the other to the abdomen. He observed an effect in the mucous membrane of the vagina, showing the penetration of the current. What was it that penetrated? We knew now that it was the high vibrations which penetrated, call them by whatever name one pleased. He was afraid that we electrotherapeutists were too much blinded by the name. We spoke of galvanism as one thing, and of faradism as something else, and of franklinism or static electricity as something else, and of high vibrations as something else, and X-ray and ultra-violet light as different things; nevertheless they were all one. These papers brought out very clearly the fact that the high

vibration was the curative element, and that the better we could learn to use this agent or dilute it to suit the particular case, the better would be the results.

♦

Dr. T. A. Pease thought that Dr. Nunn had touched upon a very important point. Personally, he believed that the chief curative action was dependent upon vibration. With his static machine of only six revolving plates he could produce vibrations which could be felt in any part of his office, and could make any metal glow just as radium did, within eight or ten feet. The transformer he used was made up of several worn-out watch springs in a glass tube. It doubled the output of the high-frequency current, and would make the vacuum tubes of Dr. Snow glow anywhere in the room without contact with the patient.

♦

Dr. Nunn remarked that he desired to make a distinction between a high frequency made by a machine and the high vibrations in the ether.

♦

Dr. Snow, in closing the discussion, said that his idea of the effect of electricity, particularly in nervous diseases, was inseparably connected with its effect in relieving inflammatory conditions. Dr. Daniels' paper was most interesting because it opened up the subject as it had never been presented before. He thought locomotor ataxia could be looked upon as a slow inflammatory process, and that it was the vibration of the X-ray that favorably affected these cases, just as it was the vibration of the X-ray that eventually produced necrosis. There was a great lack of stability in the professional mind regarding the action of the X-ray, nevertheless he believed the elucidation of this point would be found as just mentioned. Vibration must act upon protoplasm, first upon the minute cells in some way, because vibration of this character is not of the character of a mechanical vibration such as is obtained by metallic contact with the static machine. The ether vibration was transmitted along the lines of penetration in and through the tissue, and if he were wrong in this position he would like others to express their views on this topic. The ether fills the inter-cellular spaces of all tissue, and the X-ray as it passes through the tissues causes the cells to contract, in this way inducing a general contraction, thus inducing contraction of the muscular coats of the blood vessels, thereby diminishing or cutting off the blood supply. By this theory one could explain the different actions of the X-ray.

If the X-ray produced the above effects on the blood vessels it would first tend to give them tone and restore local nutrition. If, however, this line of stimulation were carried further it

would produce such a contraction of the arterial coats as to diminish or cut off the blood supply, reducing the nutrition of the tissues and even producing necrosis. This would explain the effect of the X-ray upon neoplasms, and also the difference in the effect of the X-ray upon carcinoma and other malignant processes. He thought it was almost always the case that just before the occurrence of necrosis reaction occurred (as shown by the dermatitis), and that if the stimulation were checked at this point the tissues would always return to their normal condition and necrosis would be avoided. This theory explained the relief obtained in cases of congestion and inflammation, and the relief of pain in cases of cancer and neuritis. From his point of view the action upon inflammatory conditions of the currents of more gross vibration—*e. g.* static currents—was best obtained by not using too high a frequency. If the vibration were superficial, its effect would be superficial. When there was deep congestion, therefore, we required a long spark, or a long spark-gap, when using the wave-current—one which would make the deeper tissues contract. The frequency must not be too great because the tissues must be allowed time to react. The treatment must be frequently repeated. If deep effects are required with high frequencies a high potential must be behind it in order to secure the necessary penetration.

♦

Dr. Charles O. Files said that for many years the only explanation he had been able to give himself for the relief obtained through the agency of electricity was that it reduced congestion. For instance, in insomnia the cause of the insomnia was an excess of blood within the brain. This could be relieved in many ways. Sometimes he had given a little capsicum in milk before retiring. This drew the blood from the head to the stomach, and so favored sleep. It was but an extension of the old idea of giving nourishment to the sleepless. Electricity hastened the circulation through capillary vessels in which there was more or less stasis, and so tended to relieve insomnia. In congestion of every form it had seemed to him that electricity had been able to relieve the congestion, but the frequent repetition of the electrical application was very necessary in order to secure a permanent result. This theory was a good working hypothesis, and, in his opinion, was in accordance with the observed facts. Some months ago a paper had been published in *Munsey's Magazine* by a physician who stated that electricity was of no value at all except possibly in the form of the X-ray. Personally, he felt that in every disease in which there was a congestion which could be relieved by electricity electrical treatment was indicated. This meant that it helped in a great many diseases.

Dr. T. A. Pease said that any member of the association could convince himself of the power of the high-frequency current to control deeply seated pain by applying adrenalin to the surface. Take, for example, a case of pleurisy; apply adrenalin, place a copper disk over it, using a current of five milliamperes. The part would become blanched and would remain so for twenty-four hours. Under these conditions the electricity could be made to reach to the lung.



Dr. J. R. Stuart said that he did not understand that the term "high frequency" applied to the galvanic current, but rather to the current described to-day in Dr. DuBose's paper. The speaker said that high-frequency currents of the latter character he had been using quite extensively and had been greatly astonished at the results obtained. It would, for example, relieve pain and cure a fissure of the anus in a short time. Mention was made of a case of marked and very annoying erythema of the nose occurring in a person of some prominence. This high-frequency current was applied only a few times, and yet the original erythema had almost completely disappeared. Such a result had made him marvel over the rationale of its action.



PERINEURITIS.

BY ALMERIN W. BAER, PH. G., M. D., CHICAGO.

Perineuritis of necessity includes endoneuritis and epineuritis because of our inability to differentiate with a certainty between the afflictions of the nerve and its inner or outer sheath. In diseased or traumatic conditions, contiguous portions of tissue always respond to nearby irritation. The connection between these tissues is so intimate that their symptomatology may be considered identical for all practical purposes. Irritability is the first (earliest) symptom, sometimes coming on without a definite cause; later insomnia makes its appearance with pain in a more or less definite location and contractures of the spinal nerves or their prolongations if they are the pathological entity.

The sufferer finds difficulty in straightening out the spinal column, getting the heel to the floor, and sitting comfortably, and is often unable to read or tolerate noise if any of the cranial nerves are involved.

Diagnosis is all-important. Who has not seen a patient on whom we had spent our best endeavors for days or weeks, drop off to a confrère who recognized a slight pathological, easily remedied condition which we overlooked or thought too trivial for consideration, and be symptomatically cured in one or two treatments to our chagrin?

Careful inquiry will nearly always give us a clue as to the cause of the pathological condition and if it is in the facial region we must never forget the possibility of abscess, which electrical manipulation always aggravates and which is the best means of ascertaining whether a facial "neuralgia" is caused by pus-forming organisms at the root of an apparently healthy tooth or is a neuritis proper, caused by some toxic principle, pressure caused by an embolus, arteritis, or swelling from any cause, including traumatism, and especially pressure on the nerve where it passes through a bony canal.

As we follow the spine downwards the causes of nerve irritations are usually found to be in "cold," affecting the

* Read before the thirteenth annual meeting of the American Electro-Therapeutic Association, held at Atlantic City, September 22, 23 and 24, 1903.

spinal nerves and gotten in all manner of ways, or traumatism; possibly a combination of both.

When we get to the pelvis it must not be forgotten that the pelvis itself is the seat and source of as much trouble as the great sciatic nerve.

When the trouble is acute and we use electricity in some form our patient almost invariably complains of increased pain for the first few treatments, because of the increased tension created.

In the chronic conditions it is seldom that increased discomfort is caused in either anæmic or hyperæmic conditions, whether traumatic or not.

Instead of recounting these nerve lesions it is my purpose to relate the methods of treatment employed in my practice as illustrated by a few cases.

I.—Mr. G., thrown from a buggy October 29, 1902, in falling struck his right temple against a stone in the roadway. Out side of a little pain he thought nothing of it until November 27, when partaking of his Thanksgiving dinner he happened to turn his eyes to the right of the median line, when to his surprise the dinner had apparently doubled in quantity as well as the number of participants. The young man was so badly frightened that he immediately called on his oculist, who informed him that "there was nothing the matter with his eyes." A short business trip brought him home more frightened than ever, because he had to hold a hand over one eye to get across the street. The oculist again assured him that "there was nothing the matter" and referred him to a colleague in Chicago, where he was going on business.

He was advised to see me. On examination I found a paralysis of the sixth cranial nerve of the right side, which was very plainly caused by perineuritis of the nerve supplying the external rectus muscle. Because of this he was unable to draw the right eye beyond the 90th meridian; so thus while the right eye stopped at the 90th the left was drawn beyond that point of the uninjured side by the left internal rectus muscle, supplied by the third cranial nerve, double vision resulting.

The temporal bone had undoubtedly been indented against this muscle and its supplying nerve filaments long enough to set up a traumatic perineuritis.

. Treatment consisted of the static breeze directed to the part

injured; general static treatment twice daily because I had only one week to prepare him to go about his business as a commercial traveler. The continuous current, interrupted and direct, was given once a day; each séance lasting ten minutes. At the end of the week the diplopia had decreased to the 20th meridian. One month later he presented himself and reported that he had no difficulty whatever; "Was perfectly well." Several static treatments were given while he remained in town. At a subsequent interview the gentleman's eyes were found normal as regards the eyeball motions.

Case II is a splendid illustration of a subject discussed at the last meeting of this association, namely, "How to keep our patients long enough under our treatment to demonstrate the curative effects of electricity."

Mr. S., aged thirty-seven, weight two hundred pounds, muscular build, a man who has taken fairly good care of himself considering his splendid physique. Another patient had referred him to me "to cure his rheumatism." "What kind have you?" I inquired. "Sciatic," he replied, and asked my charges. I informed him the price per treatment, but that the charge would be so much per three treatments paid for in advance, figuring from his behavior that I would never see him twice otherwise.

At the end of the third treatment he paid for the second course of three. The ninth time he came for treatment he remarked: "I don't need this, but I had it paid for and was downtown." That remark tells its own story.

This man commenced his day's work at 5.30 A. M., and the perineuritis was so severe in the upper third of the thigh as to prevent his putting his left heel to the floor before 10, 11, or 12 o'clock each day. He would hobble around on the left toes until by degrees he would finally get the heel down, even then with considerable pain.

A few months afterwards he was caught in a cold fall rain; had a few twinges and came in for three more treatments. "Wanted to avoid trouble."

Case III.—Miss R., aged eighteen, fell on an icy sidewalk eighteen months previous to the present history. She said she could not sleep more than two hours at a stretch and suffered all the time from pains in the pelvis and lower spinal region. "Every little while she had to leave her work for a few

minutes to get a change," her nerves were in such a shattered condition. Pressure on the coccyx produced a pain that did not cease on removal of the pressure.

Three treatments with the static spark produced almost a collapse; one hour after the last static treatment I gave her fifteen minutes' treatment with the interrupted continuous current (a large pad on the lower spine and two small ones on each calf) when she got up on the floor, stretched herself in various positions, and said, "I haven't an ache nor a pain."

A dozen treatments given every second or third day, symptomatically cured this case of coccygodynia, which had reached a stage of almost prostration. It is now two years since this relief was given, and the patient has never had any return of it.

Technique: Static treatment is by all odds the easiest if you can keep your machine in working order and its current agrees with or benefits the particular patient or disordered function, but it is not so beneficial as the continuous current.

I use the breeze in an interrupted current by having the patient move his feet back and forth on the metal plate, while the crown is placed beyond sparking distance above the patient's head.

I usually confine myself to a fifteen-minutes' séance of this. In the continuous treatment I use both the direct and interrupted current reduced to 40 to 60 volts; the pad applied to back and to the chest, abdomen or calf, depending on the result wanted.

Case IV was referred to me by a physician friend who could do nothing for him.

Mr. S., aged forty, large, strong man of splendid physique, fell against the corner of a window sill two years since, striking himself to the left of the spine over the third lumbar nerve. He was told that he had broken a rib because he was laid up for so long. He "has not done one tap of work for six months and very little for a year."

Treatment: Interrupted and direct continuous current as well as the static breeze were used. At the second treatment he informed me that he had just had the best night's sleep in months; on which I told him to look for a position to go to work in ten days; the smile of incredulity I received was amusing.

On the eighth day, having had six treatments, he reported

having worked since early morning in a bakery kneading bread, and having scrubbed the bakery afterwards. He of course has a little pain, but is getting better rapidly.

I almost forgot to state that the second treatment brought the source of his trouble to the surface in the form of a blue raised spot an inch and a half in length and half an inch wide and about one sixteenth of an inch above the surface in the course of the third lumbar nerve, two inches to the left of the spine and which has almost disappeared this, the eighth, day.

Discussion.

Dr. W. B. Snow said that this paper plainly showed the value of the continuous current, at the same time he could not agree with the author that it was the current *par excellence* in the treatment of neuritis. The speaker said that the author strangely mixed his treatment with the static spray. In every case of coccygodynia the relief obtained by the wave-current applied to the parts was just as marked as had been observed in the case reported from the mixed form of treatment. He took exception also to the statement that the cases were not always relieved at the time of treatment. Personally the case of neuritis that he had treated had gone away comfortable and had remained so for hours.



Dr. G. Z. Goodell said that three or four months ago a lady, thirty-five years of age, of splendid physique, and a piano player, came to him because of pain along the brachial and ulnar nerves. The pain was very severe, and she could recall having had no accident, and there was no rheumatic history on either side of the family. Finally she was brought to him by her physician. The condition was thought to be neuritis. The current of high frequency from the Kinraide coil with a carbon electrode was applied, and in ten minutes there was perfect motion of the arm, even up behind her head. One hour after leaving the office she had excruciating pain in the arm, which lasted only fifteen minutes. She returned the next day and since then had taken four treatments, two of electricity and two of the body hot air treatment. The pain was not constant, but came on unexpectedly at times. During the last body hot air treatment the pain returned with great severity, necessitating the discontinuance of the treatment for the time. The pain again disappeared under an application of the high-frequency current. This was only a few days ago. He desired further enlightenment regarding this patient, who appeared to be in every other respect in perfect health.

Dr. T. A. Pease said he wished to emphasize the causes of this trouble. To his mind it was due in probably half of the cases to stenosis, no matter whether the affected organ was the bladder, the uterus, or the rectum. He had found many cases which would not yield to the static or galvanic treatment which would readily yield after dilatation of the organ involved.

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Dr. Baer said he was well aware that Dr. Snow's technique in these cases differed materially from his own; nevertheless he had not been able to get from the static machine the results that Dr. Snow and others in New York seemed to secure. He had had no experience with the high-frequency current. The case reported by Dr. Goodell was practically one of writer's cramp or neuritis of the arm, and could be best relieved by the galvanic current. He understood that the Kinraide coil was made of very coarse wire, and as a result produced very harsh sparks. With higher oscillations the doctor would obtain better results in such a case than with a current from the Kinraide coil. In these cases there was a pressure on the affected nerve somewhere, and it was especially relieved by the galvanic current.

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Dr. R. J. Nunn said it was not true that the Kinraide coil was made of very coarse wire. The secondary coil was made of very fine wire, No. 36, and the frequency of oscillations was high.

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Dr. Goodell said that while the current was being applied from the carbon electrode there was a blue stream observable, and there was no pain experienced by the patient from the application. If, however, the electrode were removed slightly from the skin there were many sparks, and at about one-fourth of an inch these became painful.

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Dr. W. B. Snow thought he could have quickly relieved Dr. Goodell's patient by means of the brush-discharge.



A CASE OF ASTHMA WITH FIBROIDS AND PELVIC ADHESIONS CURED BY GALVANISM.*

BY CHARLES AUGUSTINE COVELL, M. D., SYRACUSE, N. Y.

In these days when we hear so much about X-rays, high-frequency currents, vacuum electrodes, etc., it may hardly seem worth while to cast a thought backward into a less highly lauded field of the art, and to consider a class of cases in which the treatment is perhaps more arduous but in which the results are nevertheless more sure. In times past the abdominal surgeons in the domain of gynecology have reaped a rich harvest. Major operations have been performed on women who should have been turned over to the electrotherapist. After the failure of the disciples of Apostoli to achieve the brilliant results of their master, the general medical profession came to regard the method of no use. I believe the time is now ripe for waging a crusade of education, and that this convention should not go by without some reference to the direct current in pelvic disorders of women.

The extended history of cases is tedious, and I will report only one which I am sure can be duplicated in many of its particulars by every worker in this field.

Aside from the electrical treatment the case that I am to report is of peculiar interest because of the fact that the asthma came on coincident with the pelvic disturbance, lasted during its continuance, and disappeared with its relief.

Mrs. B. came under my observation in the fall of 1898, at that time thirty-seven years old. Housewife, mother of one child, then twelve years of age. Family history negative excepting that mother and sister died of tuberculosis, three years before child was born had had some pelvic pain at menstruation, and occasionally between the periods, but not of sufficient importance to consult a physician. About one year later asthmatic attacks came on, lasting one day at a time. Labor at childbirth was prolonged and severe, and when child was four years old, eight years before I saw her, she had attacks of bronchial asthma every month, with pains of

* Read at the thirteenth Annual Meeting of the American Electro-Therapeutic Association, at Atlantic City, September 23, 1903.

dysmenorrhea in back, neck, and top of head, with bearing down pains in pelvis. So that several days out of each month were spent in bed. The asthma, however, seemed to be the most prominent symptom, for which the usual remedies both regular and proprietary were unavailing. The pelvic trouble at last became constant. The leading gynecologist in the city advised an immediate operation of complete hysterectomy and ovariectomy. She was prepared for operation and at the last moment refused. Her condition if possible was growing worse. I saw her about three months after the operation was given up.

She was in bed at the time with an attack of bronchial asthma, propped up with pillows and suffering intensely. A hypodermic of morphine relieved the spasm. Inquiry elicited the information that pelvic trouble was present, and a few days later a pelvic examination was made. Perineum was lacerated to the second degree, cervix low down, uterus fixed as if some plastic material had been poured into the pelvis and allowed to harden. Two masses the size of a large orange were seen seemingly attached to the right cornu. All of the pelvis and lower abdomen were tender on pressure, and my examination hurt her severely.

Because of the great tenderness and pain I used the vaginal abdominal alternations, a large pad of absorbent cotton and wire being placed over the abdomen and a le Clanché zinc insulated with rubber tubing, the tip covered by cotton, was placed in the vagina. Gradually turning the current on and off and reversing it occasionally, from 25 to 100 milliamperes were used, she being able to bear more some days than at others. Treatments were given at first every other day and later twice a week only. Improvement was rapid. In six months the exudate was absorbed, and in one year the pelvic organs were nearly normal. The fibroids were reduced to the size of a walnut and at that point persisted.

The pain ceased and as the pelvis cleared the asthma became less and less, finally ceasing also.

I did not see her again professionally for four years. One year since she became pregnant, without any unusual symptoms. She went to full term, and in May last was delivered at the Good Shepherd Hospital of a nine-pound boy. Labor lasted five hours and was normal in all respects. While she

was under chloroform I carefully examined the uterus and found two interstitial fibroids the side of my thumb.

To me the interesting things about this case are these:

1. The asthma was of reflex origin and ceased as the pelvic condition was relieved.
2. The method of application of the current in peri-uterine inflammation.
3. The uterus, which the leading gynecologist of central New York said it was necessary to remove to save the patient's life, under electrical treatment produced four years later a healthy child.

Discussion.

Dr. L. V. Gustin-Mackie said that the paper called to her mind a case in her own practice in which a woman suffered from hemorrhages produced by small interstitial fibroid. In treating the uterus for the control of this hemorrhage she had been much surprised to find the asthma relieved incidentally.



CATAPHORESIS.*

BY JAMES C. GILL, M. D., CHICAGO.

In presenting a short paper on this topic, I do not expect to give anything new or unfamiliar to the members of this association, versed as you all are and thoroughly conversant with the subject and all its details. My only reason for so doing is that it may reach others who are not members of this association, and stimulate in them a desire to become familiar with its use. During the past few years, while teaching electro-therapeutics to students at college, I have observed that invariably each class has shown marked interest in this particular action of electricity. As it is not difficult to perform and its results clearly demonstrable there is no chance for the unbelievers to say that which is usually a confession of ignorance of a knowledge of medical electricity, "psychic effect." That cataphoresis is of interest to the large majority of physicians, I have had ample opportunity to determine. I have received numerous letters from physicians whose sons were taking a course in electro-therapeutics at college, and who, having written their fathers regarding the work done, have aroused in them a desire to know more of the subject which was not presented in the curriculum during their medical course. I do not wish to discuss all the uses of this particular action of electricity, but rather to confine my few words to its usefulness in producing local anæsthesia.

Local anæsthesia is desirable in a great many instances where (1) some surgical procedure is necessary and in which for any reason it is deemed unwise to give a general anæsthetic; (2) localized pains of sufficient severity to demand anodynes for relief.

In the first class are minor surgical operations, such as opening abscesses, furuncles, carbuncles, felons, and the removal of sebaceous cysts, lipomata, moles, superfluous hairs, and other conditions which might be mentioned. In the second class occur severe localized pains, especially neuralgic in character, and localized muscular spasms.

Since the introduction of cocaine as a therapeutic agent it

* Read at the Thirteenth Annual Meeting of the American Electro-Therapeutic Association, at Atlantic City, September 23, 1903.

has been extensively employed as a local anæsthetic. As no topical application alone upon the unbroken skin will give the desired results, the usual method is to inject with a hypodermic syringe a solution of this drug into the area to be anæsthetized. Objections to this method are: (1) The pain produced by the insertion of the needle, which, in many instances, is as trying an ordeal and produces in the mind of the patient as much fear and dread as the use of the lancet primarily. (2) Dangerous and disagreeable constitutional symptoms from the introduction of cocaine into the general circulation, which are unavoidable by the hypodermic method. Knowing the idiosyncrasies of the individuals to the action of cocaine, it is not surprising that dangerous symptoms supervene upon the admission into the circulation of small amounts of this drug. I have witnessed an alarming collapse lasting for an hour or more follow the injection of 2 or 3 minims of a five-per-cent. solution. (3) Danger of formation of drug habit; although it may be used on an individual but once, the effect produced upon the nervous system is lasting and may lead to one of the most dangerous habits with which we have to deal. (4) Limitation of the area anæsthetized, this of necessity must be small because of the dangers above mentioned from constitutional disturbances. There are other means of producing local anæsthesia than by the use of cocaine, such as ether spray, ice, etc., but their effects are evanescent and unsatisfactory.

I believe that cocaine used with the aid of cataphoric action of electricity is the ideal method. Its use requires no great amount of skill and no expensive complicated outfit; an ordinary galvanic current with various-sized electrodes is all that is necessary. The strength of the current or the solution used matters but little, as the stronger the solution the less time required to produce the desired effect, and a high amperage is undesirable because of the unpleasant sensation from the electric current. The advantages of cataphoric anæsthesia are these: (1) Complete anæsthesia without pain, which fact should not be underestimated, especially when dealing with an acutely inflamed and hypersensitive area, such as is frequently found in certain conditions, necessitating the use of the knife. (2) No danger from constitutional disturbances, as the cataphoric action of the current brings the drug in contact

with the terminal filaments of the sensory nerves, and not into the absorbents as does the hypodermic injection, a sufficient amount is never taken into the general circulation to produce any noticeable effect. Personally, I have never seen any disagreeable symptom from its use in this way. (3) No danger of formation of drug habit. Patients do not know from any effect upon the nervous system that any drug has been used. (4) A large area may be anæsthetized, if necessary, with the absence of unfavorable symptoms.

The above are the essential advantages of cataphoric anæsthesia. I believe it could be used in hospitals as well as in private work to the best interests of all concerned. Knowing the dangers attending the administration of general anæsthetics, this could be avoided by the method described used in suitable cases. It has been my painful experience to have participated in two operations where death resulted from the administration of a general anæsthetic; in both cases the operation to be performed was trivial and its duration short, either case could have been anæsthetized locally in a few moments, and the operation performed with ease; yet two young lives were lost which might have been saved had the only reasonable method of anæsthetizing been used. I know of no greater misfortune which could befall a physician than death occurring under such circumstances, and if I may be the means of preventing in a single instance a recurrence of such a calamity by advocating the more frequent use of local anæsthesia by cataphoresis, I will be amply repaid for intruding upon your time with these remarks.



A NEW SYSTEM OF HIGH-FREQUENCY THERAPEUTICS.

BY FREDERIC F. STRONG, M. D., BOSTON.

(Continued from page 216.)

The complex nature of high-frequency currents, especially when considered in their relation to the human organism, renders it well-nigh impossible to explain theoretically many peculiar effects observed in the course of their therapeutic application. Our knowledge of the laws of vibratory forces and their inter-relation is at present so meager that we can do little more than observe and record clinical data, reserving for the present any hypotheses or theoretical explanations that may suggest themselves to us. We may, however, learn much that will be of value to us by a purely physical study of the subject, especially in connection with the laws governing the relation of *capacity* and *inductance*. The patient subjected to treatment by currents from the writer's apparatus and according to his system of technique, may be regarded as one side of a condenser connected with a source of oscillating current. The opposite plate of this condenser being represented by whatever electrode or capacity is connected to the opposite terminal of the apparatus. In all the methods comprised in the writer's technique it is essential that there should be an air-gap or other insulating medium in series with the patient and the terminals of the high-frequency coil. In other words, all the different forms of application producing effects similar to those obtained from the static machine, faradic, galvanic, and sinusoidal currents, are dependent upon the formation of an insulating layer or dielectric in series with the patient and the Tesla coil, and upon the *variation*, *partial destruction*, and *periodic reconstruction* of this dielectric, according to the effect that is desired. It has not been previously recognized by investigators of high-frequency currents that by artificially or mechanically interrupting the flow of the oscillatory stream it is possible to produce all the effects of muscular contraction, tissue drainage, and local stimulation that may be obtained by any other form of interrupted current such as the faradic, interrupted galvanic, static wave-current, sinusoidal current, etc., and that these effects are supplemented and augmented by the underlying specific physiological action of the high-frequency

oscillations, which increase tissue combustion, facilitate the removal of waste, and leave the body actually richer in potential nerve energy than before the commencement of the treatment. An effect which is of undoubted value in many inflammatory conditions is the periodic inflex and withdrawal of the blood and lymph streams resulting from the application of the "Morton wave-current" from a powerful static machine. The writer claims that similar effects can be produced from his high-frequency apparatus by the use of the metallic electrodes, one of which is connected to the right-hand terminal of the machine,—the electrode itself being pressed upon the affected or inflamed area,—while the other electrode, which may be held in the hand or applied at some indifferent point, is connected with the middle post or "dummy," the contractions being controlled by adjusting the distance between the two plates until a brisk brush-discharge plays between them (see the article in the April number; also refer to illustration under "New Apparatus" in that number). The contractions produced in this way are more or less irregular, but fully as effective as the more truly periodic impulses of the static wave or the interrupted galvanic. Physicians accustomed to the latter modalities complain that the high-frequency wave-current "feels as if something were out of order," or "like a 'burn' faradic apparatus." This is quite true, and while the physiological effect is the same, the suggestive effect upon the patient is not equal to that produced by more rhythmic impulses.

The writer has entirely overcome this defect within the last few weeks by placing a metronome with a loop of aluminum wire attached to the pendulum at one side and midway between the brass discs of the high-frequency apparatus. When the pendulum is away from the path between the discs no contraction is felt, but as the loop of wire is carried between the discs by the opposite swing of the metronome a brush-discharge of gradually increasing intensity is produced and as gradually obliterated. The sensory effect resulting from this method is as rhythmic, pleasant, and effective as that obtained from any electrical apparatus with which the writer is familiar.

Within the knowledge of the writer there is no apparatus (a) that will produce such a volume of powerful X-rays from the same amount of electrical "wattage"; (b) that will maintain such a steady ray and hold the tube at a given vacuum

for such a great length of time; (c) that has relatively so little heating effect and drain upon the life of the tube; or (d) that combines the maximum destructive action upon morbid growths with the minimum amount of superficial inflammatory action—as the X-ray which may be obtained from either form of the writer's perfected high-frequency apparatus. The writer has a tube which retails for \$10.00 that has been in almost daily use for over a year, and which shows no evidence of severe use other than a slight blackening from volatilized platinum. More will be said in this connection when discussing the results of clinical work and report of cases treated.

(To be continued.)



REPORT OF THE COMMITTEE ON CURRENT CLASSIFICATION AND NOMENCLATURE.*

(Continued from page 298.)

WERBER SECTIONALLY INSULATED DISCHARGE ROD.

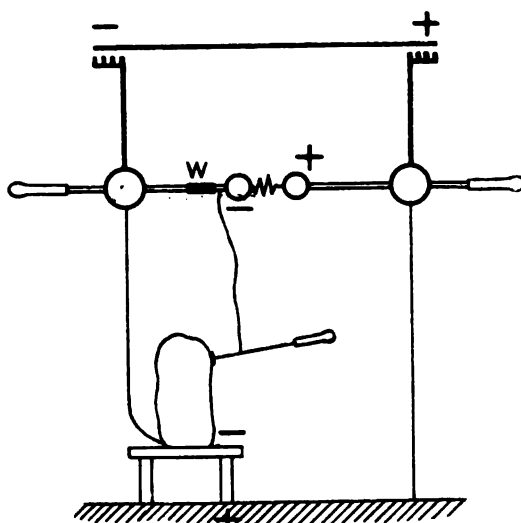


FIG. 11

This apparatus is described in the JOURNAL OF ADVANCED THERAPEUTICS, Vol. II., p. 293, May, 1902. One of the dis-

* Read at the Thirteenth Annual Meeting of the American Electro-Therapeutic Association, at Atlantic City, September 24, 1903.

charge rods consists in part of a section, W, of insulating material. It practically amounts to placing the patient directly in the path of the circuit, from one prime conductor to the other, through the spark gap between their discharge knobs. There may be some slight modification of the current due to the feeble condenser condition between the patient and earth as two plates of a condenser. This arrangement appears in effect to be substantially like the old Duchenne combination, except that the Leyden jar is omitted, and the patient is not subjected to the direct blow of the spark.

GEISSLER AND VACUUM-TUBE APPARATUS.

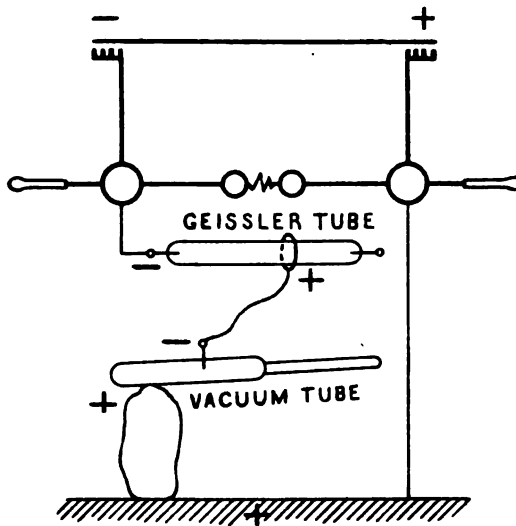


FIG. I

No special description of this combination is necessary. The currents are of exceedingly high frequency, as given out by the vacuum tube, and of a potential depending upon the position of the conductor which encircles the Geissler tube. The Committee has no knowledge as yet of the currents which traverse the patient when he is intercalated in the circuit.

"INTERRUPTED INSULATION."

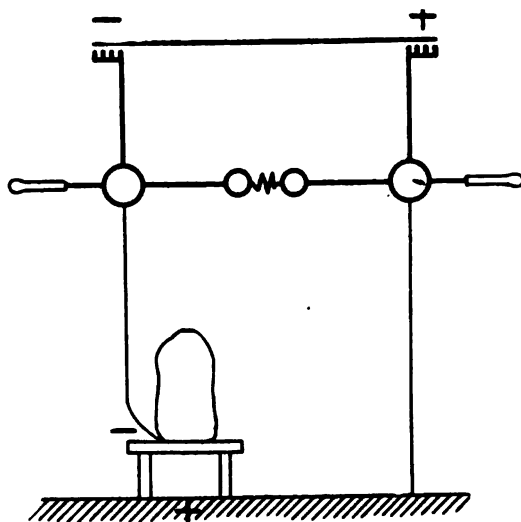


FIG. J

This designation is meaningless. The arrangement appears to be somewhat like that of the "wave-current" apparatus, only the current need not in this case necessarily traverse the patient. Of course, the patient is charged and discharged, and the density of charge on his surface, as one plate of a condenser, the other plate being the earth, is continually shifting in position, which doubtless will give rise to small local currents.

"STATIC INSULATION—STATIC BATH."

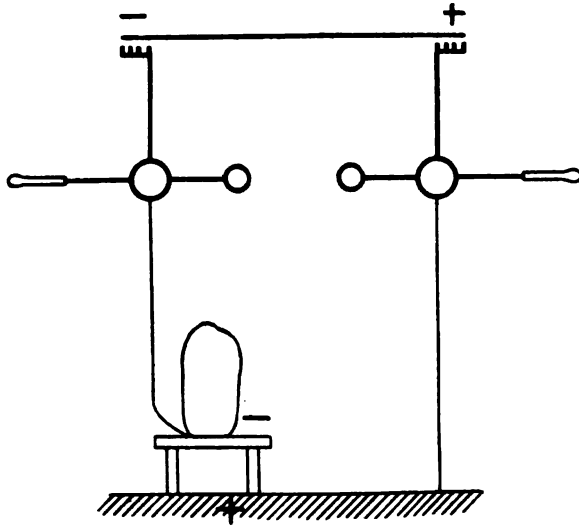


FIG.K

The effect in this case is more feeble than in the previous one, as no current will flow in the patient after he is charged except that required to maintain the charge against possible leakage in the form of silent continuous current brush discharges to neighboring objects. The Committee does not understand the significance of the term "Static Insulation."

**"BREEZE" OR "CONCENTRATED BRUSH DIS-
CHARGE."**

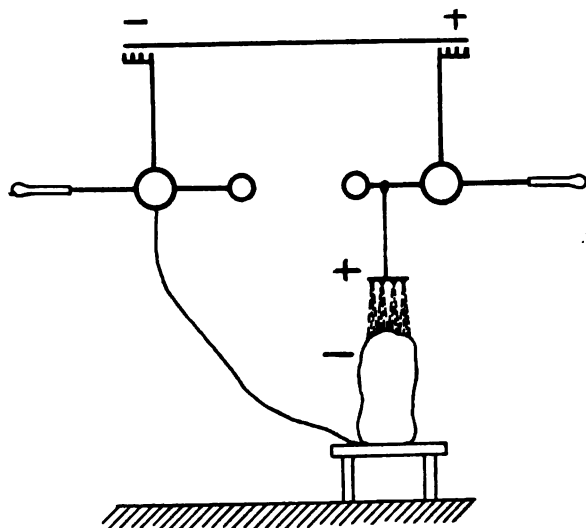


FIG.L

Here the leakage of the arrangement shown in Fig. K is concentrated and directed upon any desired area of the patient's body. This results in increased useful flow by reduction of leakage. The density or concentration is modified by varying the number of discharging points, a great number and corresponding diffusion of effect in applying the breeze to the head being secured by the use of an inverted crown-shaped electrode.

A further modification for application of the treatment to other parts of the body is realized in the use of an electrode of wood, pointed or knobbed. This must not become too dry, and practice is said to indicate the desirability of porous, rather than dense and well seasoned material. With large currents and slender points, carbonization of the wood is said to occur. Some advantage is reported to have been found in soaking the wood in water before using it. The difference in resistance between such electrodes and ordinary metallic

ones is comparatively unimportant, but is thought to be of sufficient consequence to make it desirable to adjust, according to conditions, the length of wooden rod in the circuit. A wooden knob probably occasions a diffusion or discharge from many microscopic points, and the relatively high specific resistance prevents accidental short circuits and gives a generally mild effect while the electrode is in actual contact with moist animal tissue. A wooden electrode of cylindrical form, and covered with a glass test-tube, is sometimes used to administer the breeze, or brush discharge.

"DIRECT SPARK."

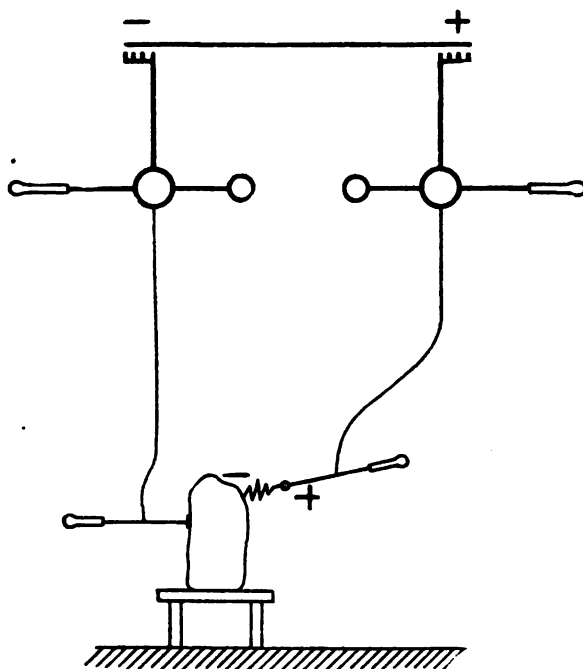


FIG.M

This is an arrangement by which sparks, due to the capacity of the generator and its own unmodified potential, are directed to any part of the patient's body. Probably the current is a direct as well as a pulsatory one, or one of comparatively low frequency.

(To be concluded.)

Editorial.

PHYSICAL METHODS IN THE TREATMENT OF ORGANIC DISEASES.

THE study of the therapeutics of organic disease from the earliest times has been associated with the selection of drugs either specifically indicated for the treatment of the disease in question, or directed to the treatment of the general health of the patient. In the earlier history of the profession the disposition was to seek some drug or therapeutic agent especially adapted to each disease, and when mythology did not add to the mystery it was expected that some miraculous effect would take place, from the particular adaptability of the remedy to the improvement of the action or restoration of the organ in question. The study of pathology and the knowledge of the relations of the different organs of the body with each other, and the substitution of the activity of one organ for another, to aid in the elimination of waste products from the body by other than the normal channels, has gradually led up to the belief in the use of agents which increase metabolism and thereby improve the general nutrition.

The effects of mercury and iodide of potassium upon syphilitic growths have led to the adoption of these measures in the treatment of chronic inflammations and infiltrations, more especially of iodide of potassium, to the extent that it has been employed in the treatment of all slow chronic processes, and generally, with very little success. It has been employed more for the reason that there has been no other remedy which would meet these chronic conditions, than with the expectation of accomplishing much from its employment, except the disease might be of specific origin.

The local applications of heat have for ages been recognized as of value in the treatment of superficial conditions and have afforded great relief when applied to acute inflammatory processes, but failed in affecting permanent relief in chronic affections.

The employment of exercise and massage has occupied a valuable position during the ages for the relief of conditions in which these influences could be brought to bear upon the

chronic conditions as in joint and local affections and the limbs, also in the treatment of some internal conditions.

More recently, the employment of high-potential electricity, superheated dry hot air, mechanical vibration, and radiant light and heat baths have occupied the attention of the advanced workers in the medical profession. The value of these measures at the present time, though unfortunately not appreciated by the majority of the profession, who have not the means at their command, are invaluable in the treatment of organic diseases.

When the fact is recognized that most chronic diseases are associated with inflammatory processes and that the indication in these conditions is to relieve local obstruction and inactivity in the tissues, promoting an increased nutrition and local and general metabolism, it is self-evident that the agency which shall relieve these conditions must be potent and searching.

After all, the indications to be met in the treatment of organic disease not associated with specific or germ processes are to overcome local congestion and institute normal circulatory and nutritional conditions. That this may be accomplished in conditions to-day that are considered incurable to a remarkable degree is demonstrated in the successful treatment of cirrhosis of the liver, chronic nephritis, colitis, myxoedema, Graves' disease, and numerous similar conditions.

The application of the static wave current in the treatment of chronic visceral conditions is one of the most certain and practical means at the physician's command. The action as is well known combines both the local vibratory or mechanical action with a general stimulation. The activity of dormant cells throughout the whole organism is induced—the surgings of the current to and fro from the surface of the electrode in contact with the patient to the surrounding surface of the body insure the invasion of the remotest recess in its passage.

It is customary in treating any organic condition to place the electrode immediately over the organ in question in order to induce the local vibratory effects which tend to disengage the part.

Progress in Physical Therapeutics.

GYNECOLOGY AND APPLIED METALLIC ELECTROLYSIS.

BY G. BETTON MASSEY, M. D., PHILADELPHIA, PA.

Cataphoresis, with Special Reference to Its Value in the Treatment of Malignant Disease. By F. O. Marsh, A. M., M. D., Cincinnati. Cincinnati Lancet-Clinic, February 20, 1914.

The attention of the writer having been drawn to the use of cataphoresis in medicine and surgery by the writings of Dr. W. J. Morton of New York, and especially by the extended clinical reports of Dr. G. Betton Massey of Philadelphia, the idea was conceived of endeavoring to further test the possibilities of the cataphoric action of the constant current from a purely experimental standpoint. The term cataphoresis is somewhat unfamiliar even to the student of pure physics, and usually conveys a meaning rather obscure.

The actual transportation of material particles, or, more properly, the propulsion of them into the substance of a fluid or semi-solid electrolyte, which the term implies, is less frequently observed in the physical laboratory, and, indeed, seems, upon first thought, to be directly inconsistent with the cardinal principles of the familiar phenomenon, electrolysis.

A brief recapitulation of the terms in common use in dealing with these subjects may be convenient.

Briefly electrolysis signifies the decomposition of a more or less fluid substance by means of an electric current passing through it. Thus, by means of a current of proper strength from a constant-current battery or dynamo passed through water, the latter will be decomposed into its original elements, oxygen and hydrogen, the oxygen being evolved in a free state at the positive pole and hydrogen at the negative pole. Observation of this fact affords a very simple means of detecting the positive pole in a constant current by connecting each pole with a steel sewing needle, and inserting the two points, without being in contact with each other, into a drop of water, when the needle connected with the positive pole will shortly become blackened through the action of free oxygen, while the negative needle remains bright.

The electric current having a definite direction from the positive to the negative pole of the battery, the positive pole or any conductor or conducting handle connected with it is also called the anode or path or point of departure, while the negative pole is called the cathode or point of arrival.

The fluid undergoing decomposition is called the electrolyte.

The elements into which the electrolyte is resolved are called ions, those evolved at the positive pole, or anode, being termed anions, those at the cathode cathions. Thus the electrolytic decomposition of water, oxygen is, the anion, hydrogen the cathion.

Sir Humphry Davy, who determined the principal facts of electrolysis, about the beginning of the nineteenth century, enunciated the law that oxygen and acids are anions, while hydrogen, alkalies, and metals are relatively cathions.

By means of a powerful constant-current battery placed at his disposal, he first succeeded in obtaining the metals potassium and sodium at the cathode by subjecting their fused alkalies to the action of the current.

The term electron is of more recent origin, and applies to certain theoretical bodies supposed to be the ultimate electric units composing matter.

In the ordinary process of decomposing water by electrolysis, the separate gases are seen to be evolved only at the surfaces of the respective electrodes immersed in the fluid. There is no apparent disturbance of the intervening tract of fluid to be observed.

Sir Humphry Davy devised an experiment for demonstrating the neutral state of this intervening tract by using three glass cups, the fluid contents of which were connected by moistened strands of asbestos.

In one of the end cups was placed a solution of sodium sulphate, in the middle cup a solution of syrup of violets, in the other end cup pure water. The constant current being made to pass through the system from end to end, the acid or alkali of the sodium sulphate could be made to appear in either end cup respectively, depending upon the direction of the current, but the remarkable fact remained that no evidence of acidity or alkalinity developed in the middle cup, which would have at once been rendered apparent by a corresponding change of color, the syrup of violets being extremely sensitive to the presence of acid or alkali.

This has been accounted for theoretically by assuming a series of hand-to-hand molecular exchanges taking place among the elements of the intervening tract of fluid in such a manner as to prevent the evolution of free acid or alkali except at the terminals.

The results of this experiment would at first sight seem to preclude the possibility of driving chemicals into the tissues of the body by cataphoresis.

The writer had devised a modification of Davy's experiment by simply moistening a ribbon of blue litmus paper, an inch or more long, and laying it upon a glass plate. By means of electrodes of platinum foil, the current of the battery of eight or ten carbon cells was applied to each end of the wet ribbon.

The alkali was at once seen to develop a stronger blue in immediate contact with the cathode and the acid a red color similarly at the anode. But an additional phenomenon soon began to superimpose itself in the gradual diffusion of the red acid color from the anode and the intensified alkaline area from the cathode, with finally only a narrow neutral zone in the middle of the field between them.

The foregoing experiment has been described with some minuteness, as the phenomenon of diffusion of the acid reaction around and away from the anode is what must be really meant by cataphoresis. Such diffusion is not due merely to osmosis or capillary diffusion through the fibers of the paper, for it ceases to progress at once on breaking the current.

It will thus be seen that cataphoresis is not inconsistent with electrolysis, but is simply an engrafted phenomenon.

In this connection it is important to note sharply that the acid is not repelled from the cathode in such a way as to make a *visible transit* across the field to the anode. Hence the idea of driving anions into the tissues of the body for general or local absorption by means of applying the cathode is a delusion, as, for instance, iodine through the skin by the application of the cathode. The disappearance of the iodine under such circumstances is in all probability due simply to the local conversion of iodine into hydriodic acid, which is colorless, by the action of nascent hydrogen developed from the moisture of the skin under the influence of the cathode. The same is true of driving kathions (*e. g.*, cocaine) into tissues by the anode, as such would only take place in combination with chlorine and oxygen, and be attended by impairment or destruction of vitality of tissues, which would prevent absorption. Ptyalism in Massey's operation never occurs.

In conducting experiments on cataphoresis the author has used the 110-volt standard Edison current to some extent, as well as the current derived from a battery of his own construction. This battery is of the zinc carbon type, the fluid being composed of one part commercial sulphuric acid, six parts saturated solution bichromate of potash, and containing a proportion of about one or two ounces bisulphate of mercury to the gallon.

The elements of each cell of the battery consist of two carbon plates and one plate of amalgamated zinc of the uniform size, five inches by one and a half inches, and one-quarter of an inch in thickness.

These are bolted in sets of four to quarter-inch supporting strips of wood in such a way as to allow their immersion in four standard Mason pint fruit jars, each containing about thirteen ounces of the battery fluid. For a battery of twelve cells, a dozen of these jars can be used as they come packed in the box. Two carbon plates being used for each cell

renders the internal resistance lower than in the ordinary form of constant-current battery purchased for office use, increasing the quantity or amperage of the current correspondingly. In fact, such a construction furnishes the most powerful form of primary battery possible, giving an average of two volts per cell.

Twenty-four cells of such a battery connected in series furnish a current of 45 to 50 volts at about twelve amperes on short circuit. Dr. Massey, in his operative work, uses a battery of his own design, furnishing a current as high as 160 volts from 80 cells.

His method of operating described by himself in his writings is briefly, in the first place, to adopt a current of sufficient voltage to overcome resistance of the body.

The anode, consisting of a heavily amalgamated zinc rod or a hollow gold electrode containing mercury (for mercurial cataphoresis), is inserted through a small incision into the depth of the growth.

A broad sheet of lead, guarded by moistened thicknesses of cloth, applied to the back of the patient, furnishes the cathode, or indifferent pole. A current of sufficient strength is gradually turned on and maintained for a sufficient length of time for the morbid area to become permeated with zinc or mercury salts. The major operations are conducted under general anæsthesia, maintained for an hour or more, the result being that the morbid growth is converted into a gray or lead-colored eschar, devoid of pain or foul odor. The eschar sloughs in a week or so, leaving a healthy wound to heal by granulation.

In order to demonstrate the cataphoric action of the current under conditions approximating those of the living tissues, the writer has found it convenient to use the white coagulated albumen of a hard-boiled egg, which has been cut in half and placed upon a metallic plate connected with the cathode, while the anode, consisting of a point of clean copper wire, is thrust into the summit of this hemisphere of coagulated albumen.

A current of forty or fifty volts being turned on, the evolution of gas from electrolytic action begins at once, and almost simultaneously a distinct greenish area begins to form around the anode, owing to the oxychlorides of copper being repelled from the anode and being diffused in a widening circle by cataphoric action.

As it is the disposition of all electrified bodies to fly asunder, the above phenomenon may be regarded as largely due to the repulsion from the anode of the positively electrified molecule of copper contained in the oxychlorides.

With anodes of mercury or amalgamated zinc, the cataphoresis is still more rapid. With a current of fifty volts, the writer has seen an area of half an inch saturated with salts

in three minutes. As described in the experiment with moist litmus paper, the cataphoric action is not entirely dependent on the evolution of metallic salts, as it is altogether probable that oxygen itself, when once evolved at the anode, becomes electro-positive and is diffused by repulsion. But in the proposed destruction of malignant growths the development of oxychlorides from zinc or mercury, or both, renders the process more rapid and enhances the effect. With zinc and mercury, the white of the egg under cataphoresis becomes condensed, dead white, and opaque instead of semi-translucent.

In comparison with the rapid action of cataphoresis, the local application of the usual caustics, zinc chloride, copper salts, lime, and caustic potash with absolute alcohol is immensely inferior.

It should be stated that the oxychlorides are derived by decomposition of water and chlorides contained in the animal tissues.

A practical suggestion which has occurred to the writer is the use of an anode composed of a paste made by an amalgamation of granulated or powdered metallic zinc with mercury, using an excess of the mercury to prevent recrystallization and hardening. Such a paste is, of course, a metallic conductor, is highly electro-positive, and can be molded like putty to an irregular or inconvenient ulcerated surface, or perhaps adapted to other situations.

GENERAL CONCLUSIONS.

Experimental tests tend to substantiate the claim that cataphoresis offers unique and special advantages for the destruction and disinfection of morbid and malignant growths *in situ*, and in many cases reflection would confirm the belief that it offers advantages over the removal *en masse* by the knife, curette, or actual cautery.

In any but the most superficial growths its action is quicker and more penetrating than the X-ray in its therapeutic action, as the all-pervading action of the X-ray in securing skiagraphic effects seems to bear no relation to its limited therapeutic effects, as in destruction of superficial epitheliomata, etc.

To obtain proper results the application must be made through the action of a powerful current somewhat prolonged, and used under anæsthesia.

The method is, of course, powerless against anything but the local condition where internal metastasis has already taken place.

While it is possible to obtain a beautiful primary union after a cutting operation, as an excision of the breast, the ultimate results, as obtained by Massey in over sixty unselected cases of malignant disease, seem to be far superior.

A final consideration not to be neglected is the fact that the high mortality from malignant disease, as, for instance, cancer of the female breast, is owing to the difficulty of securing permission to make an early and thorough extirpation.

Those of us who, after the introduction of the operation of intubation, even in the pre-antitoxin days, had occasion to make that operation, know of the decreased mortality from croup, owing to the substitution of non-cutting operation and the ease with which consent could be obtained.

The possibility of obtaining early consent to effective interference without the use of the knife would naturally tend toward a material reduction of the total mortality from malignant disease.

[Remarks.—We have reproduced Dr. Marsh's interesting article *in extenso* as a valuable contribution to a subject of growing importance. Dr. Marsh shows a full comprehension of the technique of cataphoresis, and makes a valuable suggestion in the advice that active electrodes may be molded from semi-liquid zinc-amalgam to touch all parts of a malignant surface simultaneously. In the practice of the editor of this department, and in his demonstrations of this method at the New York School of Physical Therapeutics, the rule that active electrodes act better when actually inserted into the growth has been maintained. In the case of large surfaces of slight depth the superficial area under actual treatment has been increased by the expedient of employing a large number of small points made of thin zinc, and attached to a leash of No. 32 fine copper wires. By this means the cataphoric destruction and sterilization are made to penetrate the growth over as wide an area as the current employed will quickly act upon. Twenty such points simultaneously acting, with 400 milliamperes in the circuit, will give 20 milliamperes to each point—quite an effective current when the points are applied close to each other. Dr. Marsh's suggestion, nevertheless, deserves a trial under appropriate conditions.—G. B. M.]

PHOTOTHERAPY.

EDITED BY MARGARET A. CLEAVES, M. D.

Dr. Julius Rosenberg collates a number of cases, in reviewing his experience with phototherapy. He is of the opinion that in light a remedy of no mean order is to be had, and one

which, in the near future, will occupy a most exalted position; the possibilities of the curative action of which are still unknown.

For a source of energy, he uses a 55-ampere iron carbon arc. He regards the high amperage necessary and the specially prepared carbons. The divergent rays are collected by the mirrors of the apparatus, enabling him to throw and concentrate the light upon a given point. Exposures are from 55 to 75 minutes; a shorter application he regards as not of lasting benefit. In a sensitive skin, the expenditure of so great an energy and one so rich chemically, over as prolonged periods, may produce an erythema, but with ordinary care he finds that it does not produce blisters nor other injuries. The treatment, as a rule, is not only not unpleasant, but affords relief from any pain from which the patient may be suffering, and is, therefore, gratifying both to patient and physician.

He reports twenty cases, nearly all of whom were suffering from some form of neuritis. In a few cases there was a history of injury. In all save one the result was good; in most recovery.

A coccydynia from traumatism patient, miserable for a year, with unusual tenderness over sacro-coccygeal articulation, nothing abnormal in condition of rectum and genitals, was considerably relieved after first treatment, and free from pain after two weeks' treatment.

In a case of ovarian neuralgia, left, of years' standing, organ enlarged and tender, where local treatment, tampons, etc., had been used without much relief, the patient was relieved by first treatment, and apparently cured after five exposures. Ovary smaller and no longer sensitive. The other cases reported are of equal interest.—*New York Med. Jour.* and *Phila. Med. Jour.*, April 23, 1904.

Light in Tuberculosis.

It is interesting to note that Stubbert, in presenting a "Historic Sketch of the So-called Cures of Tuberculosis, with a Few Notes on Latter-day Treatment," predicts that within the next three years notable advances in immunization and the stimulating effect of light will be seen.—*Medical News*, April 16, 1904.

Actinic Sunlight in the Treatment of Pulmonary Tuberculosis.

Kime contributes a second paper on this subject. Since (apparently) his removal to Denver, he has substituted blue glass for the skylight of his treatment room, instead of facing his concave reflectors, three feet in diameter, with blue glass as formerly. The strongest chemical frequencies (other than the ultra-violet) are, in this way, focused upon the chest walls of the patient.

The following is the order in which improvement occurs: loss of chills and night sweats; gain in body weight; increased appetite; lessening and disappearance of diarrhea, if it is present; increased strength, as a rule rapidly, and ability to walk considerable distances as against short distances before; diminishing cough, without the use of medicines; declination of febrile conditions, in from a few weeks to two months or more, and after two or three months a return to the normal, where it remains. Bacilli are almost the last evidence of the disease to disappear, as they were also the first factor in the production of the disease.

Frequently patients leave the sanitarium with bacilli still remaining, and when they return a few months later the bacilli are found to be absent from the sputum.—*New York Med. Jour. and Phila. Med. Jour.*, April 30, 1904.

[Remark.—The experience of Rosenberg in neuritis, neuralgias, etc., that of Kime in tuberculosis, as well as the prediction of Stubbart, are all of great interest, and gratifying as well, to the writer, who for the past ten years and a half has had the electric arc in almost daily use, with similar results in the same class of cases. Stubbart's opinion that much is to be hoped for in the stimulating effect of light, is doubtless born of actual clinical observation, as light apparatus forms a part of the equipment of the Loomis Sanitarium.

Since 1895 there has been no question in the writer's mind but that in a systematic and skillful expenditure of light energy, (1) sunlight and (2) the electric arc, combined with the best hygiene and sanitation, held very great possibilities for curable tuberculosis of the lungs, joints, peritoneum, as well as of tubercular glands and skin lesions.

It is more than a coincidence when every observer notes the same passing of symptoms and the same improvement in curable cases. To the incurable its use is a comfort, as long as they are able to have treatment of any sort. The relief of painful nerve conditions is one of daily occurrence as well as the pain and stiffness of injured and rheumatic joints.—*The Editor.*]

N Rays.

Since first noting the discovery of the N rays by Blondlot in these columns, there has come to be quite an extensive literature on the subject.

No further comment has been made, because the exactness of Blondlot's observation has been questioned by able physi-

cists. There is, however, an accumulation of considerable data on the part of different experimenters, which seems to point conclusively to the correctness of Blondlot's original observation. At first the N rays (named in honor of the University of Nancy, with which Blondlot is connected) were placed at the infra red end of the spectrum; more recently evidence points to their belonging to the violet end; their mean wave-length being something like one-tenth that of extreme violet light. Blondlot first detected them as coming from an excited X-ray tube, but it was soon observed that they exist in sunlight, and also in electric gas and other sources of illumination. Metals under severe molecular strain, as hardened steel, also gives out N rays. They are not all of one kind and Blondlot has distinguished N rays. The N rays pass easily through aluminum, black paper, wood, and saline watery solutions, but are arrested by water. They are capable of reflexion, refraction, and polarization, and the index of refractions has been determined by means of aluminium prisms. Some substances seem to have the power of accumulating or storing up N rays. They are said to have the power to increase in length the electric spark and also to cause increased phosphorescence in many substances, and Blondlot has described a photographic method of recording changes in the electrical phenomena and brightness of phosphorescence. They are also said to increase visual acuteness, and Blondlot believes them to act upon the retina.

According to Bichat, N rays act differently when bodies are placed in their path, and he has shown a possibility of selective absorption by different metals. Macé de Lépiney thinks that during musical vibration in such instruments as the tuning fork or siren, these rays are given out apart from the molecular strain. According to Jegou they are given out during the passage of a current in an electric wire. Charpentier seems to think that they may be transmitted through a metal wire and excite phosphorescence upon a suitable screen at the other end of it, but he considers that these are probably not ordinary N rays, and Bichat thinks that the conduction through a wire is much the same as that of light waves passed through a curved glass rod.

The observations and reports of Charpentier (University of Nancy) have increased medical interest in the physiology of the subject. He states that rays similar to the Blondlot rays are given out from the human body during muscular and nervous excitement. The rays thus produced increase phosphorescence, the length of the spark of a coil, the passage through certain solid bodies, and the reflection, refraction, and index of the latter seem to be the same as the N rays. Absolute darkness, according to Charpentier, is essential for some observers, while others require relative darkness only,

and the screen should be excited first in order to see if there is an increase of phosphorescence during the application of the N rays. They are not, he is confident, the result of heat, because of their immediate development, *i. e.*, a few seconds, whereas the effect of heat takes much longer; moreover, he is satisfied that similar rays are emitted from animals, such as the frog, which may be kept at a temperature from 0° to 10° below the air. The phosphorescence of bacteria is augmented by them. They are not only given out by muscles in contraction, but compressions of nerves give the best results. Charpentier selects certain regions, such as the spinal cord over the cervical and lumbar region, for special demonstration. Not only does he find this true, but he declares that central convolutions, such as Broca's augmentation, take place while one is speaking. Other centers of brain are said to act similarly. Mental effect may be observed by others and the experimenter himself, inasmuch as this causes the fluorescence to increase upon the screen. Lastly, he declares that the rays are complex in nature and that filtration through different metals will result in different effects.

These observations of Blondlot have been substantiated by Walsham and Leslie Miller of London. On the other hand, Schenk, Burk, McKendrick, and Campbell Swinton, have not been able to confirm the observations of Charpentier. A great deal of skepticism still exists, however, both among physicists and physiologists as to the correctness of the observations.

The foregoing facts are gleaned from current literature and especially from an address by John McIntyre, *British Medical Journal*, April 23, 1904.

That there is a truth in Charpentier's observations, the writer is prepared to believe. In a chemism such as the living organism, it were strange if rays of some sort were not given off.

And the reported increase of fluorescence upon the excited screen, as the result of mental effort, finds its counterpart in the movement of the light beam of the mirror galvanometer when placed in circuit with the subject.—The Editor.

CURRENTS OF HIGH FREQUENCY AND HIGH POTENTIAL.

EDITED BY WALTER H. WHITE, M. D.

Clinical Studies on the Therapeutic Action of the High-frequency Currents in the Diseases of Nutrition. By Dr. E. Bonnefay, Cannes.

The doctor cites 28 cases which have been benefited by him. Among the diseases mentioned are arthritis, gout, rheumatic

gout, lithæmia, obesity, and diabetes. He speaks of its physiological action as well as the therapeutic effect. Quoting from the works of Prof. d'Arsonval, Apostoli, Charrin, Doumer, and others, that the high-frequency current should be the base of all treatment in cases of mal-assimilation. The treatments in most cases were daily at first and some of the cases were cured in six to ten applications, the average time required being three or four months, daily treatments for the first month, and then every second day; later, twice a week. In tuberculosis of other parts, joints, etc., many electrical methods have been used, but in my hands the best results have been obtained by general electrification combined with a vacuum electrode from the resonator. Cases of old-standing tuberculous lesions are very amenable to electrical treatment.

At the same meeting were mentioned, Dr. Brocq, in 1897, treated 62 cases of lupus, with 46 cures. Lately Dr. Bordier reports 73 cases with a like percentage of cures.

Primary carcinoma of rectum was reported, after four months' treatment, one-fifth of original size, and patient in every respect much better.

Recurrent epithelioma of cheek cured in 24 applications. Rodent ulcer, 10 applications, and remains cured after nearly three years. Cases of gout, chronic rheumatism, sciatica, and hemorrhoids are cured with the same treatment.

Treatment of Phthisis by High-frequency Currents.

Dr. Chisholm Williams, in a paper read before the British Electro-therapeutic Society, reports forty-three cases of pulmonary tuberculosis, all of them over one year's duration. Four had died during the past two years. The patients increase in weight with increase of appetite, etc., as the currents seemingly increase their digestive powers. The temperature was for a time raised in accordance with the length of applications and the strength of currents.

Night sweats increased, at first, and the bacilli followed almost the same course as under the X-rays outside the body. Those cases of a more obstinate character were then treated three times weekly, and later, as improved, twice a week. In conclusion, he considers of currents of high frequency the greatest aid to-day in electro-therapeutics.

RADIOTHERAPY.

EDITED BY J. D. GIBSON, M. D.

Roentgen Rays in the Treatment of Pruritus Ani. By J. R. Pennington, Chicago. New York Med. Jour., Feb. 20, 1904.

This is a very instructive article, dealing with this very troublesome condition. The doctor gives the very interesting

discussion of its pathogenesis and reports thirteen cases treated and cured by the use of the X-ray. It is well, in studying these cases, to remember the pathology as stated—that it is a low-grade inflammation, with thickening of the tissues and a chronic condition generally, thus making it applicable to the proper and judicious use of X-ray. The author, who is an expert in rectal diseases, and has had considerable experience with the X-ray, has succeeded in bringing his thirteen cases to a complete and successful termination.

In the hands of an expert in these cases, as shown in this paper, the X-ray is a very valuable agent, and one or two cases, by careless and incompetent handling, to the author's knowledge, have come to grief and cast a good deal of reflection upon radiotherapy. I would give a warning and call for special care in the treatment of these cases.

Notes on X-ray Treatment with Special Reference to Scirrhus Cancer of Breast. N. L. Deming, M. D., The Fort Wayne Med. Jour.-Mag.

The report includes eight cases treated by X-ray, seven successfully. All of the cases were of sarcomas or scirrhus of the breast. The writer believes in the use of high-vacuum tubes and close applications, with short exposures. In most of his cases the surface was unbroken surface, and the author is to be congratulated upon his success in bringing them to a successful issue. He has a machine or coil having a twenty-inch spark capacity, and most of these patients were treated with a tube high enough to stand the apparatus at full capacity.

The editor of this department believes that there is a great field for high-vacuum tubes, and attributes many failures to the use of tubes of too low vacuum, which readily produce dermatitis, but do not penetrate deep enough to reach the depth of infection, and therefore eradicate the trouble entirely.

Sarcoma of the Orbit (Knapp's Archives of Ophthalmology, January, 1904). By Dr. Fox.

The patient, aged twenty-three years, consulted Dr. Fox on account of a bony enlargement of the naso-orbital region.

Six weeks before she noticed an enlargement of the region named, and proptosis and diplopia were found present on examination. Some pain was present, while the visual field was normal and so was tension. Upper lid was chemotic and distended and the conjunctiva also. The tumor was attached to the bony wall, and of the size of a large olive. Large doses

of iodide of potassium were given, but had no effect, and, after peculiar tetanic symptoms developed, an exploratory operation was performed. The antrum was opened, but found not to be involved, then the ethmoidal cells were opened from without and a considerable amount of yellowish glairy fluid escaped from the cells.

Free communication was established with the nasal cavity and the wound closed. There was an entire cessation of the pain, but no effect on the exophthalmus or swelling of the lids.

In a couple of weeks "a mass of granulations appeared in the wound," which the microscope revealed to be a spindle-celled sarcoma. The case was turned over to Dr. Phaler for X-ray treatment and forty-six radiations were given in all with a high-vacuum tube, when the sarcoma had entirely disappeared.

The report of this case is of importance as it was evidently a sarcoma involving a bony structure, which is generally considered to be absolutely impregnable to this method of treatment, while it will be noted that complete relief was obtained.

Pathological Changes Due to X-ray. Pith of Current Literature, April 16, 1904.

Newcomet concludes: First, no single form of degeneration is alone characteristic of the X-ray, and that the form of degeneration observed depends entirely upon the tissues exposed and the method of X-ray application; second, it would seem that the effect of the X-ray was upon the cell elements in the exposed parts, but why certain normal cells, such as those in the hair follicles, etc., should be more susceptible than other tissue, is still a matter of doubt, but in view of the vascular disturbance found by many observers it might be thought that this cause plays an active part.

The X-ray in Tuberculosis. By W. Y. Dieffenbach, M. D. The Kansas City Medical Record.

Under this title the doctor reports two cases of severe tuberculosis of the lungs, treated by means of X-ray after all other methods had failed. He gives a very intelligent history of the cases and reports them cured and doing well, several months after treatment was discontinued.

The editor is pleased to see reports of these cases and would be glad to have reports of results from all who give it a fair and intelligent trial, as it is desirable to have statistics of treatment of tuberculosis by the X-ray.

THERMOTHERAPY.

EDITED BY CLARENCE EDWARD SKINNER, M. D., LL. D.

Superheated Dry Air. By A. P. Baird. California Med. Jour.

The following cases are reported, which we quote in full:

"Mrs. W., aged about 40, had a most severe case of sciatica, affecting the sciaticus magnus about its exit. Fifteen minutes after placing her in the apparatus, she exclaimed she felt as if she were in heaven. She was free from pain, something she never knew for months; so intense was her suffering that she could not ride in a rubber-tired buggy without crying out for pain, when crossing the street-car tracks. She required twenty-eight treatments, extending over a period of three months, when she could walk where she pleased, without pain.

"Case No. II.—Dr. F. telephoned me one morning, inquiring when he could come to my office, as he had not slept all the previous night, notwithstanding he had done all he knew to remove a rheumatic pain in his right shoulder. I had him come over at once, and applied a temperature of 550° F. to the affected place, and he had no pain from first treatment. Next morning it was in his left shoulder, a temperature of 400° F. fixed that; he had no more.

"Case No. III.—Mrs. B., general peritonitis; little hope of recovery; called in Dr. H., in consultation; he gave no encouragement; determined to try hot air; had small apparatus sent up, used it three times a day: improvement from first treatment, second day considered her out of danger.

"Case No. IV.—R. E., a youth of fifteen years, had an attack of otitis media, both ears discharging pus; could not hear my watch tick one inch from his ear; pain severe. Five treatments restored hearing to normal; first treatment dissipated pain."

Baird considers that dry hot air produces its effects by influence upon the physiological resistance of the cells which are pathologically altered, and that no agent is capable of so quickly and thoroughly dissipating congestion as intense heat. He does not recommend heat to the exclusion of other methods but takes the logical ground that it should be used in combination with them.

Superheated "Dry Air" as a Therapeutic Agent. Bittle C. Keister, Va. Med. Semi-Monthly, April 8, 1904.

Eight cases are reported. The first was a case of chronic rheumatism occurring in a man fifty-six years of age, in which there were present swelling, stiffness, and severe pain in both knee joints, with a high fever. Patient could not walk with-

out crutches. Salicylates and iodides were administered for two weeks with only temporary results. Patient was given five body dry hot air treatments at a temperature of from 240° to 290° F., each treatment lasting from forty to sixty minutes, followed by an hour's massage of the entire body. After three treatments patient was able to walk from the apparatus to his sleeping room without crutches, and after five treatments returned to his home without assistance, and to his usual duties, which he has fulfilled ever since without any return of his rheumatism.

The second case was diagnosticated as uric acid poisoning with symptoms of melancholia, lumbago, pain in the joints, etc., and occurred in a man forty-eight years of age. He had been in a nervous state and unable to attend to his duties for about six months. Microscopical examination of his urine showed an excess of uric acid crystals. He was given six body dry hot air treatments, followed by massage and the tepid bath, during a period of three weeks, and has remained well ever since the conclusion of this course of treatment, a period of about sixteen months.

The third case was diagnosticated as emphysema of the left lung and uric acid diathesis. It occurred in a man sixty-eight years old. Patient had spasmodic asthma and severe bronchitis. Had been sick for a year. After unsuccessful use of the ordinary remedies, patient was given three body dry hot air treatments, with massage and returned to his home apparently well. One attack of dyspnoea occurred four months after the conclusion of the treatment, which subsided at once and represents the only indication of a return of the trouble which he has had for fourteen months.

The fourth case was diagnosticated as rheumatoid arthritis of left knee of four years' standing. The knee was twice as large as the well joint, measuring twenty-three inches in circumference. Great pain attended any movement and ankylosis was developing. Dry hot air was applied every two days for ten days, followed by massage with alcohol, iodine, and lanolin, at a temperature of from 260° to 300° F., each treatment lasting from forty to sixty minutes. (Whether the treatment was local or general is not stated.) In two weeks the affected joint was reduced to nearly the normal size, patient had discarded his crutches, could walk nearly as well as he ever could, and suspended treatment.

The fifth case was diagnosticated as "cerebral anæmia complicated with cerebral neurasthenia, caused from overwork of the brain forces and uric acid poisoning," and occurred in a bookkeeper aged thirty. He had been treated by a number of different physicians for a number of different ailments. "His most constant symptoms were severe pain in the front and top parts of the head and the lack of power on the part

of the brain centers to concentrate his thoughts on any particular subject or remember any one thing. He also complained of some pain in the back, along the course of the spine." Blood examination showed a considerable diminution in the number of red blood corpuscles. Urine examination showed an excess of uric acid crystals, with granular casts and a trace of albumin. Patient's father had died from chronic Bright's disease. He was given five weeks' treatment with superheated air (frequency and details of treatment not stated), together with iron, arsenic, and bone marrow, and dismissed apparently well.

The sixth case was one of chronic Bright's disease of three years' standing, in a man aged sixty. Urine showed forty per cent. of albumin by bulk, casts of every variety, and frequent hemorrhages from the kidneys. Patient greatly emaciated. He was given iron, strychnia, and bone marrow with a milk diet for three weeks, with considerable benefit. At the end of that time body dry hot air treatments were added to the previous regimen. After the second treatment the blood disappeared from the urine and the albumin diminished fully one-half. The number of treatments that he had is not stated, but Keister feels positive that five years have been added to the man's life through the agency of the therapeutical measures used.

Another case of chronic Bright's disease is mentioned in which the body dry hot air is being applied once a week, in which the patient is making rapid progress toward recovery. No positive results are stated.

Keister concludes that "We have in the superheated dry-air method a most wonderful agent in the treatment of many chronic diseases that have baffled the skill of the medical profession in past ages."

HYDROTHERAPY.

EDITED BY CURRAN POPE, M. D.

Sea Bathing in Some Forms of Skin Diseases. R. Abrahams, Medical News, March 26, 1904.

R. Abrahams' experience extends over but two summers, but the success attained warrants the suggesting if not recommending this as a reliable curative agent in pityriasis versicolor, herpes tonsurans maculosus et squamosus, chronic eczema, and pruritus senilis. In view of the failure of sea water to cure when used in bathing establishments the conclusion is that, beside the chemic properties of the water, benefit is derived from the longer immersion and the pounding of the bil-

lows, thus rubbing the water more thoroughly into the skin, and also from the exposure to the sun in the intervals of the dips, which dries the solids of the water into the skin, and, lastly, from the rolling on the sand of the beach, which wonderfully helps to remove scales and other pathologic débris thus affording the water a better chance to penetrate.

Normal Salt Solution and Butter as Stimulant and Nourishment, Subcutaneously and Cutaneously Administered, in "Swamp," Enteric, and Scarlet Fevers. By S. L. Williams.

The title of Williams' article explains the subject, but the account of his experiences with the remedies is of interest. He reports cases where life has been apparently saved after every other means had failed by subcutaneous injections of salt solution and inunctions of butter cutaneously. His experience impresses him with the great absorption through the lymph capillary system and the helpfulness of keeping the skin epithelium nourished, especially in diseases where the high stages of hyperæmia and the desquamation react on the nervous system. His plan in using salt solution is to insert two ordinary hypodermic needles, externally, below the hip joint and alternately fill and slowly force syringeful after syringeful, according to the demands, using gentle massage after these injections until the results are obtained or abandoned as hopeless. With butter there is but one simple means of applying it; spreading it over and rubbing it in where the skin is thin, or all over the body when there is fever or nervous excitement.

The Diagnosis and Treatment of Hyperchlorhydria. By E. G. Eggleston, *Modern Medicine*, January, 1904.

Hyperchlorhydria is a neurosis in which the acidity varies greatly; being common to the extent possibly of 35 to 50 per cent. of all cases. It is found in people in the higher walks of life who are sedentary and who are subjected to mental strains, worry, and grief. Alcohol and condiments are local causes. The symptoms commonly observed one or two hours after meals; relieved by alkaloids; appetite and general physical condition good; obstinate constipation, tenderness over the sympathetic; some scenes of dilatation. The test meal confirms the diagnosis. In discussing the treatment, stress is laid upon congestion of the internal viscera, and he says "to relieve this is most readily accomplished by the full or half pack; the electric-light bath or the half electric-light bath. Anything which tends to encourage a congestion of the skin

and extremities tends to relieve the congestion of the digestive organ. If the patient is strong and able to stand more energetic measures, electric-light bath until free perspiration; this is to be followed by a very brief cold application; either cold mitten friction, cold spray, or the half bath, anything which tends to produce a normal circulation in the skin." The production of free perspiration has a direct influence in lessening the acidity of the gastric secretion, but patients must be cautioned against prolonged cold applications.

The hot foot, leg, and the alternate hot and cold foot bath are of some value. In some cases where dilatation exists lavage is beneficial. Hot water taken one-half to three-quarters of an hour before meals by itself has a soothing effect, tends to allay the irritation of the gastric mucosa, clears the stomach, and is an active sedative.

These measures, in conjunction with out-door exercises, massage, Swedish movements, and electrical treatment, form the basis of physiological measures by which the disease may be overcome. Proper diet and an absence from home are conducive measures toward restoration.

Hydrotherapy and Diabetes.

The writer had the pleasure of listening to Dr. A. F. Crofton read his entertaining and interesting paper on the "Treatment of Diabetes," at the last meeting of the Mississippi Valley Medical Association, and a recent editorial in *Modern Medicine* for February recalls this paper, and notes that Dr. Crofton has shown by careful experimentation that the sugar normally contained in the blood and lymph is destroyed in standing at blood temperature. The lymph was found to possess greater sugar-destroying power than the blood. Dr. Crofton states that the sugar-destroying power rests in the white blood cells, and that these cells carry a special ferment that takes in the production of the oxidation of sugar. He called attention to the fact that alkalinity was favorable, acidity unfavorable, to the action of the ferment, while an increase of temperature aided its action. All hydropathists know, and have known for years, that hydrotherapy was a valuable aid to the diabetic. By the use of heating procedures, especially the hot air, electric light and similar procedures, until free perspiration was induced, and following this by stimulating cold applications, much good was accomplished, the basis of which was supposed to be the increased oxidation of sugar. Dr.

Crofton's investigation coincides with Strasser's, for we know that cold baths increase the alkalinity of the blood and with this increased alkalinity the ferment becomes more active. By the free flooding of the blood with water at frequent intervals, the quantity of sugar in the blood is thus kept nearer the normal, and the ferment thus becomes more active. My personal experience coincides with that of Kellogg, Baruch, and other hydiatists of experience, that the use of hot baths, vapor, electric light, the blanket packs, etc., by means of which the temperature of the body is raised and oxidation increased, followed by stimulating cold applications, resistive exercises, cold water drinking, exercises and proper diet, become by far the most important measures for the treatment of this disease. It is an interesting fact that discoveries heretofore made in a clinical way coincide so heartily with the scientific investigations of Dr. Crofton, and I believe that if the profession could be weaned from the idea of drug medication in this disease much more good would be accomplished and better results secured for these sufferers.

C. P.

PSYCHO-THERAPY.

EDITED BY LESLIE MEACHAM, M. D.

"*Psycho-Therapeutics.*" A. T. Schofield, M. D., London. Psychological Section, Seventy-first Annual Meeting of the British Medical Association. Abstracted in British Medical Journal.

Commenting upon the fact that text-books give little attention to psycho-therapy, he asserts that the mind plays some part in the cure of every disease, a fact not true of any other curative agent. The force of mind in therapeutics, though largely ignored by the profession, is successfully exploited and abused by quacks everywhere. The secret of the success of quackery is that it effects cures, and, unfortunately, the public places a higher value upon cures than diagnosis. One reason why psycho-therapeutics have not been more used is the psychological limitations of mind, some physicians apparently limiting mind to consciousness.

Sir James Paget has said: "In hysteria there are many who cannot bring about a mimicry of disease by any effort of imagination or direction of mind. Among these I am happy to count myself. I have tried many times carefully, but always have failed."

Conscious effort is powerless here. It is the unconscious mind alone that can produce true mimicry of disease. Neuro-mimesis is not malingering. Hysteria is a mental disease, and if mind is limited to consciousness, the mimicry must be consciously produced and fraudulent, but the mimicry can be mental and yet unconscious. Allowing this to be true, insanity is a disorder of the conscious mind, and hysteria a disorder of the unconscious mind; the conscious mind being sound. There really is but one mind and consciousness, the faculty by which some of its actions are discerned and guided.

He advocates strongly the teaching of the force of mind and the placing of psycho-therapeutics in the study and practice of medicine.

[It must be borne in mind that hypnotism and auto-suggestion establish a connection between conscious and unconscious mental activity, and that while mimicry of disease cannot be produced by voluntary effort, it can be effected by auto-suggestion, if the individual places himself in a passive condition, and is possessed of a good imagination.—L. M.]

"The Psychologic Factor in Medicine and its Application to Nervous Diseases." By John P. Punton, M. D., Kansas City, Mo., Professor Nervous and Mental Diseases, University Medical College, etc. Read before Missouri Valley Medical Association. Abstracted in Charlotte Medical Journal.

Dr. Punton makes a strong plea for suggestion as an adjuvant in treatment. Among other arguments, he emphasizes the fact that "under certain conditions the mind exerts a powerful influence on the body for good or ill, hence mental processes are often responsible for profound physical changes, and conversely purely physical processes are capable of producing marked and profound mental changes. How these changes take place is something difficult to explain, but their presence in the individual is undisputed.

"If scientific medicine means what Dr. Hadra tells us it is, viz.: 'The sum of systematized knowledge acquired in every conceivable manner, and that it must have full and perfect liberty and not allow itself to become imprisoned within certain limits, and that its object is nothing more than truth itself,' then I think we, as regular physicians, have sufficient latitude to compass any and all methods, under whatever name they may be known, that prove successful in the alleviation of suffering and disease."

Thus a thought of weakness in a limb may make normal

movement impossible and a functional paralysis results. The conception of a pain by constant introspection leads the patient to believe that he has a cancer. Casual remarks of physicians and others may give rise to new features in a case, or exaggerate existing ones, leading to morbid fears and phobia-obsessions. These cases and similar ones must be cured by mental impressions, the agent being known under many synonyms as hypnotism, Dowieism, Christian Science, etc. Suggestion is the chief cornerstone upon which all these are reared, but to be patent for good in therapeutics, it must embody the various elements which belong to the psychologic factor, often requiring great care and judgment. The mental traits and characteristics of the patient must be carefully studied, his full and complete confidence gained.

This form of treatment embodies an educational scheme which has for its chief purpose the remolding of the mental forces. The essential qualifications of the newly acquired mental formula should embody hope, progress, and co-operation with sufficient force and power to impress upon the patient's mind the certainty of recovery. The plan is to restore to the will its normal control of the emotions and intellect, and to teach the patient to become more self-confident and self-reliant. The nature and character of the physician's mentality must, of necessity, appeal to the intelligent co-operation of the patient, and impress the patient as to their potency for good. Employ such adjuvants as electricity, massage, hydrotherapy, dietetics, employment, drugs, and amusements, and any other possible agents. All these elements, judiciously selected and employed, often benefit by establishing hope for fear, courage for despondency, confidence for distrust, peace for hostility, harmony for discord, happiness for sorrow, and, above all, health for disease.

Such results are the highest art in medicine, irrespective of the means employed.

The time is at hand when the regular physician who attempts to practice the healing art without giving due credit to this part of his education, is wholly unprepared to meet the various exigencies that belong to the relief and cure of morbid nervous affections. Its universal adoption in medical practice will not only win new laurels for ourselves, but also restore the waning confidence in the efficacy of the science of medicine when practically applied.

BOOK REVIEWS.

THE PRACTICAL APPLICATION OF THE RÖNTGEN RAYS IN THERAPEUTICS AND DIAGNOSIS. By WILLIAM ALLEN PUSEY, A. M., M. D., Professor of Dermatology in the University of Illinois, member of the American Dermatological Association, and EUGENE WILSON CALDWELL, B. S., Director of the Edward N. Gibbs X-ray Laboratory, University and Bellevue Hospital Medical College, New York; Member of the Röntgen Society of London; Associate Member of the American Institute of Electrical Engineers. Published by W. B. Saunders & Company, Philadelphia, New York, and London. Price \$5.00 net.

Part I of this valuable work is devoted to Radiotherapy, and is a result of a large experience in that department of X-ray work by Mr. E. W. Caldwell. That the author has made an elaborate study of the subject is evident from the character and scope of his work. He has introduced many interesting features, which will be of service to the novice as well as the advanced practitioner. The author has devoted much attention to apparatus which will be appreciated by students of the subject; especially valuable to the workers with the Ruhmkorff coil. Particular attention has been given to the methods of handling and adjusting the tubes and plates as well as to the development of the radiograph. The subject of posturing for getting the best results in the radiograph, has received particular attention, and the author has shown remarkable ingenuity and tact in his methods, which will be highly appreciated by the profession. The contribution is an advanced one and in every way up to date.

Part II of the work, by Dr. Pusey, is devoted to the Therapeutics of the Roentgen Ray. The valuable feature of this contribution is in the record of the large number of cases treated by the author, whose results have certainly been most flattering, as shown by the numerous plates illustrating the results of treatment. The author has shown the pathological conditions and changes resulting from X-ray treatment in a most convincing and practical manner. The work as a whole is invaluable to the student of the X-ray, and should be in the hands of every practitioner who wishes to be up to date in all of the details of the art.

The authors and publisher are deserving of congratulation for the thoroughness of execution in all of the features of the work.

RADIOTHERAPY. By DR. LEOPOLD FREUND. English Translation by G. H. LANCASHIRE. Publishers, Rebman Co., 10 West 23d St., New York City. Price \$4.00 net.

The profession are to be congratulated upon being able to obtain Freund's very complete and erudite work in English. It covers the subject of Radiotherapy most comprehensively and is enriched with valuable experimental data.

Chapter I is devoted to the Elements of Electricity. Chapter II, Treatment with High-Frequency Currents. Chapter III, Treatment with X-rays. Chapter IV is devoted to Becquerel Rays, their Physiological Effects and Some Therapeutic Experiments, while Chapter V is devoted to a consideration of Treatment with Light and Heat Rays.

Notes on Instrumentation, by Clarence A. Wright, F. R. C. S. (E.), completes the volume and brings the reader up to the present, in so far as mechanisms for the use of these methods is concerned. It is to Freund, perhaps, more than any other, that the profession owes the foundation of Roentgen-therapy.

It is interesting to have demonstrated in so able a manner, and as the result of much and careful experiment, the fact that "the character of the tissue damage, and the finer molecular changes in the protoplasm, appear in all cases to be similar, whatever be the particular agency employed: vacuolization degeneration resulting from the action of light (Glebofsky), Roentgen Rays (Gassman), high-frequency electricity (Freund)."

It is only an illustration of the unity of this trio in a physical sense, and points to one and the same factor as active in producing these changes, in each one of them.

The book is a little difficult, as is apt to be the case with translations, but its merit is so great as to very completely over-balance these defects. In the extensive literature quoted, the statement is made that many have held that incandescent-light baths have a specific influence on tuberculosis, scrofula, and other infectious diseases, assuming the bactericidal action of light to account for their influence.

In this connection he quotes Cleaves, among others. So far as the reviewer knows, she was the first one to use all the radiant energies of the electric arc in pulmonary tuberculosis, but has never used the incandescent-light bath in the same class of cases.

The book is well put up by the publishers and is cordially recommended to the profession.

M. A. C.

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TIONS.**

BY G. BETTON MASSEY, M. D.

The great labor attending the care of acid batteries when a cataphoric operation is performed at the residence of the patient has been an immense obstacle to the popularizing of this method among surgeons. The loss of time was great, for usually an hour was required to fill the cells at the house, where the batteries had to be sent in an empty condition; clothes and cuticle, and sometimes tempers, were ruined; and after the current was turned on it was liable to fluctuate if all of the many zinc elements were not fully amalgamated. In a recent instance the writer and his assistants were greatly incommoded by acrid fumes emitted from two freshly re-zinc'd batteries out of the five employed, the mechanic entrusted with the work having failed to cover every portion of the zinc elements with the protecting mercury, and the success of the application was seriously jeopardized, aside from the disadvantage of the fumes to the patient, already under ether.

After many somewhat similar experiences, the writer determined to test the possibility of using the largest size of commercial dry cells for this purpose. One hundred Columbia dry cells were therefore ordered from the manufacturers, the largest size, measuring 8 x 3 1-2 inches, being specified. The weight of these cells being considerable, it was necessary to place them in five boxes, twenty in each, with a suitable cell-collector on the inner cover of each box. These boxes were made for me by Otto Flemming of Philadelphia, the necessity for an accurately made 20-point switch collector in each demanding an expert manufacturer.

One of these 20-cell units is shown in the accompanying illustrations. The switch is so made that when the lever rests on O the current of other units that may be turned on will be short-circuited through it, permitting all the units to be connected up and any number to be thrown in or out of circuit as desired, without interruption of current. The cell-collectors are, of course, of the old-fashioned type, permitting a gradual inclusion of cells, one by one. This necessitates the disadvantage of each cell being momentarily short-circuited when the lever spring touches two buttons.

The battery was first tested at the residence of a patient in this city on April 15, the case being a large sarcoma of the

ano-rectal region some seven inches wide, and extending deeply into the pelvis. With large dispersing pads covering the greater part of the patient's trunk, five zinc-mercury electrodes were inserted into the growth and the current turned on at the switch of the first unit, cell by cell, with great smooth-



Fig. 1.—Massey Transportable Battery for Heavy Current Cataphoresis.
One unit, containing 20 large Columbia dry cells.

ness. The large controller was found not to be necessary, though in subsequent applications its use was returned to after the probable number of units were turned on.

To our surprise but two units, or 40 cells in all, brought the current up to 1600 milliamperes, the large dispersing pads greatly lessening the resistance of the patient. This large current, which was even as great as 1700 milliamperes for a time, was maintained with remarkable steadiness for an hour and a half, when, sufficient action having been secured, it was turned off. The voltage of the units that had been used was then tested with a volt-meter, showing a drop of but three

volts for the forty cells, the original voltage of two units combined having been 60 volts. One week later these cells had recuperated partly, the voltage of the two combined units then being 58.

On the 25th of April the apparatus was carried thirty-five miles by rail and used in an extensive carcinoma of the breast.



Fig. 2.—Massey Transportable Dry Cell Battery with switchboard raised, showing hinged lid and method of wiring. The cells are held firmly in place by three wooden bars, not shown in figure, permitting transportation of the battery in any position.

On this occasion three of the units were used in circuit with the large controller, and 1000 to 1600 milliamperes were applied for 43 minutes. The cells acquitted themselves perfectly, the fall of voltage being scarcely perceptible. Since then the batteries have been used in three additional operations as follows: On May 5, 500 milliamperes for one hour, in a carcinoma of the rectum; on May 9, 1240 milliamperes for two hours and a half, in a second application to the sarcoma of the peri-rectal tissues; on May 10, 1000 milliamperes for two hours, in a carcinoma of the breast.

Up to the time of writing the batteries have been used at five heavy operations, with a present falling off of but five volts for the whole battery. They have not only demonstrated their great convenience and reliability, but shown that with cells of large amperage a less voltage is required for the cathophoric treatment of cancer than had been considered possible.

The first cost of such an installation is about the same as that of portable acid batteries (though it is apparent from the above experiences that fewer cells will suffice). The cost of maintenance is, at first sight, greater, a complete renewal of the cells being necessary when the voltage falls below a volt per cell; but when it is remembered that acid batteries require fresh charges of fluid for each operation, and renewal of all the zinc elements after every third or fourth operation, their cost will equal that of a new set of dry cells for every ten or fifteen operations. That the large Columbia cells will last longer than this is quite probable.

The total weight of the five units is about 720 pounds, each unit requiring a strong man to handle it. The boxes are stoutly made, and when the cells are securely braced in place, the batteries may be handled by the average baggageman with impunity, in any position, provided they are not allowed to fall from a height.

AN X-RAY TUBE WITH ADJUSTABLE FOCUS.

If one examines the outline of a shadow from a light emanating from a large area—*e. g.*, a gas-light—it will be seen to compare favorably with the outlines on a fluoroscope or on a picture, when the X-ray is used from a tube having the anode out of focus. On the other hand, the outlines of a shadow emanating from a small area—*e. g.*, an arc lamp—resemble the outlines on a fluoroscope or on a picture, when an X-ray tube having a sharply focused anode is used (Figs. 1 and 2).

The X-ray emanates from the molecular bombardment of the rarefied air in the tube on the surface of the anode. The structures of rarefied air are repelled from the concave disc or cathode forming the cathode rays or stream. This cathode stream striking the surface of the anode or disc in the center of the tube produces the X-ray. To obtain a sharp focus the anode must be a given distance from the cathode, just as an object must be a given distance from a lens to be in focus.

In making a Crookes tube by all methods used heretofore, it has been practically impossible to get the anode the required distance from the cathode, so as to obtain a sharp focus, as the stem supporting the anode had to be sealed in the glass by guess, and the tube exhausted it before it could be tested, when if the anode was found defective in respect to its focus, it was too late to remedy the defect, without going to an expense nearly equal to that of making a new tube. A microscope

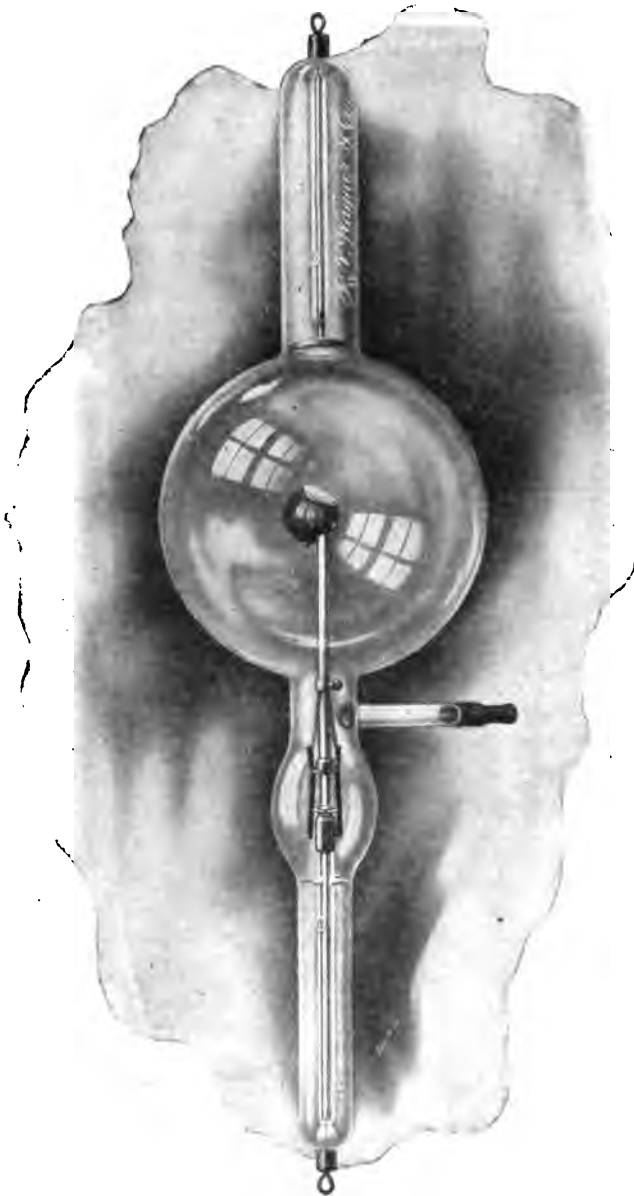


Fig. 1.

cannot be focused accurately by a person who guesses at the distance the lenses should be from an object, without looking through them. This would be much easier, however, than

to focus a Crookes tube by guess as to the distance the anode should be from the cathode, because of the skill required on the part of the glass-blower to seal in the stem supporting the anode so as to hold it where he thinks it should be; his judgment of where it should be is purely guesswork, because there is no way of testing until the tube is exhausted and properly excited.

The new feature in this tube is in having the anode mounted on a threaded stem which can be magnetically operated

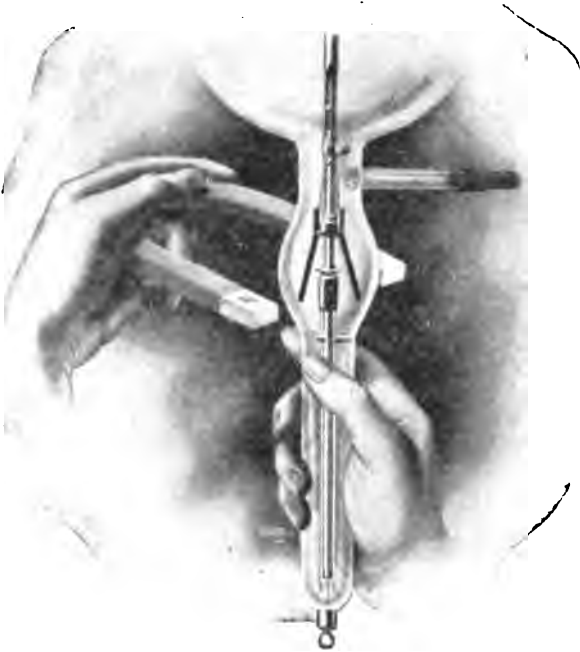


Fig. 2.

through the glass, so as to move the anode up or down or circumferentially with the surface of the tube; to obtain an absolutely accurate focus (Fig. 2.).

The little armature on which the magnet acts cannot possibly get out of adjustment, and will hold the anode in any required position, either in focus or out of focus, as the operator may desire for some therapeutic purposes.

With this method of magnetically adjusting the anode, it is possible to make every tube alike, and to accurately focus the same after the tube is finished and in operation, just as you focus a microscope by looking through the lenses, instead of guessing at the adjustment by observation as to the distance of the lenses.

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ELECTRICITY IN THE TREATMENT OF CHRONIC DEAFNESS.*

BY GEORGE Z. GOODELL, M. D., SALEM, MASS.

This paper is compiled from correspondence and interviews with others who have used this agent in the treatment of those chronically deaf, and research into the literature of the subject, rather than a description of cases in which it was used by myself, although I will report results in a few cases.

At the beginning I will state that I intend to consider cases of non-suppurative otitis only, or what is termed chronic catarrhal otitis media, a disease affecting the middle ear and Eustachian tube.

Sound is conducted from the outside world to the inner ear by the membrum tympani, malleus, incus stapes, and obturator or annular ligament of stapes connecting with fenestra ovalis, or entrance to the inner ear.

In order to have the ear in its best condition, the same air pressure must exist on both outside and inside of the membrum tympani and the ossicles should articulate normally. The Eustachian tube allows ingress of air to the middle ear and keeps the air pressure equal.

The pathology of chronic catarrhal otitis media consists in repeated inflammations of the mucous membrane lining the upper air passages, and, by extending through the Eustachian tube, that lining the middle ear. The first result of this condition is a hypertrophy of the mucous membrane lining the middle ear and Eustachian tube, diminishing the caliber of the tube and impairing the movements of the ossicles and membrum tympani. By frequent repetitions of this pathological state, the nutrition of the parts is disturbed and we have an atrophic condition supervening, causing more room in the middle ear and extreme patency of the Eustachian tube, dry-

* Paper read at Atlantic City, Tuesday, September 22, 1903, at the Thirteenth Annual Convention of the American Electro-Therapeutic Association.

ness of the tympanic membrane, and stiffness of the joints of the ossicles amounting in some cases to ankylosis.

The authorities generally incline to the opinion that the disease is not an inherited one, but I certainly feel that the tendency to the condition is an inherited one, for I know in one family a father, two sons, and three daughters who are all deaf, presumably from this disease.

Chronic catarrh of the middle ear is generally bilateral and indicates its probable origin from disease of the upper respiratory passages. There is also a unilateral form occasionally seen caused by repeated changes of temperature on one side of the head, as in riding at a certain open window of a suburban train every day, or working in a shop or store exposed to a continual draft on one side of the head. Another form, which we may call for convenience false otitis media catarrhalis chronica, is caused by exposure to constant sharp impinging sounds, as in boiler making, cotton mills, and the like. One distressing symptom is the tinnitus which often accompanies this disease.

The indications for treatment are, first and all the time, to attempt to put the nose and throat in the best possible condition, in the hypertrophic stage to secure patency of the Eustachian tube, and in the atrophic stage to break up the ankylosis of the ossicles and improve the nutrition of the middle ear.

In my investigations I have found spoken of for the electrical treatment of this disease: interrupted, continuous, and static electricity, high-frequency currents, ozone, electrolysis, and the use of various apparatus energized by electricity.

Interrupted.—A conical electrode is used in the auricle, covered with wet chamois skin, absorbent cotton, etc., or the auricle is first filled with warm water. The other electrode is one of the dispersing type and is used on the wrist, neck, or some convenient place. The current should be mild and used for several weeks, ten minutes at a time, three times a week; or, as some observers say, daily. It makes little difference what pole is used, as the action of both is practically the same.

In a letter from Dr. Robert Newman, dated August 12, 1903, he says that "high-tension (faradic) currents will do if there is a kind of paralysis," referring to its use in chronic catarrhal otitis media.

Dr. Albert H. Andrews (*a*) says: "The mild faradic current seems to do good in the first or simple stage, probably by stimulating the muscular walls of the blood vessels and helping them to regain their former tone. The prognosis is good, providing the Eustachian occlusion can be permanently relieved."

We find in Vol. VI of the course published by the International Correspondence Schools of Scranton, Pa., on page 63, that the writer thinks that mild faradism relieves in old middle-ear disease by breaking up the ankylosis of the ossicles.

In a letter to me last October, Dr. C. J. Blake writes: "The faradic current I have always used cautiously because of its stimulating effect on the intra-tympanic muscles and its tendency to bring about persistent contraction of the tensor tympani tendon."

Dr. Scheppegrell says (*b*): "Faradism has also been used in the treatment of diseases of the middle ear, but not to the extent of galvanism. The latter is undoubtedly the more efficacious in these cases, although there are some indications in which the former is useful."

Dr. Bishop says (*c*): "The application of the faradic current for ten minutes daily for several weeks has appeared to exert a beneficial effect in certain cases. . . . However, we do not attach great importance to electricity in this disease." Several observers speak of relieving the tinnitus by the use of the interrupted current, but none report cures of middle-ear disease by this treatment.

Continuous.—This current is used in the same manner as the interrupted, one pole with a small electrode in the external auditory meatus, and the other, of the dispersing type, on the neck or wrist. The positive pole is sedative and the negative pole is stimulating. The positive pole is the one preferably used in the ear. The sittings should not be more than ten minutes long, and a current of not more than three milliamperes administered, about three times a week.

(*d*) Dr. H. Campbell has used the galvanic current with success in chronic catarrh of the middle ear by first passing a little sterilized water into the middle ear through the Eustachian tube and then using a metal wire passed through the Eustachian catheter into the middle ear as the electrode.

Dr. Robert Newman (*e*) treated a number of cases as early as 1868 to 1874 with galvanism with some success.

Dr. C. J. Blake writes to me: "I have sometimes found improvement in hearing and decrease of tinnitus follow application of the anode, the current being very slowly increased and decreased."

Dr. S. H. Monell advises that we incline the patient's head so that the affected ear is uppermost, fill the canal with a warm solution of sodii bicarb. Use an insulated rubber speculum with the negative pole and the positive pole with an ordinary sponge electrode, provided the Eustachian tube is patent, under the angle of the opposite jaw ten minutes every second day. Absorption is promoted.

Weak currents as a rule and the poles changed occasionally is suggested in the International Correspondence School Course.

The continuous current is reported by several observers as having been beneficial in several cases in diminishing deafness and in relieving tinnitus.

Static.—Static is little spoken of for deafness, although Dr. Henry C. Houghton feels (*f*) that static and faradism combined are better than galvanism. Dr. Walter H. White showed me a rubber speculum (French), solid except for a hole through its center one-eighth of an inch in diameter, through which ran a metal shaft about two inches long, with a ball on each end, the inner one about one-quarter of an inch in diameter and the outer one about one-half inch. This was intended to be held by the patient and the static spark used on the outer ball.

High-Frequency.—The technique of this method of treatment consists in using the aural vacuum electrode, of which Dr. Snow's is an example, for three or five minutes in the affected ears two or three times a week. I was unable to see Dr. Frederick F. Strong of Boston, who has made high-frequency currents a close study for years, but was fortunate in seeing his brother, Dr. Thomas M. Strong of the same city, who told me that they had both used them in a limited way in the manner spoken of above, with, in some cases, relief of tinnitus and deafness.

Ozone.—Dr. G. Stoker, in the *Lancet*, Nov. 1, 1902, says that in a chronic dry catarrh of the middle ear, after the stenosis of the Eustachian tube and nasal passages is relieved, should there be any, ozone is used in the following manner: "The ozone was generated by means of an electric current acting

on a Ruhmkorff's coil to which the ozonizing tube was attached. The ozone so generated is pumped into the middle ear through a Eustachian catheter for about three minutes two to four times a week, according to opportunity." No results are given.

Dr. G. Lenox Curtis of New York in a recent letter to me writes: "For the past six years I have had a very interesting experience in the treatment of catarrhal affections with ozone—among them many cases of middle-ear affections. Most, if not all, of these cases have been materially benefited and many apparently permanently.

Electrolysis.—This is used as a means of dilating strictures of the Eustachian tube. Dr. Robert Newman of New York and Dr. A. B. Duel of the same city have been the most strenuous advocates of this method. I cannot do better in describing the technique of the operation than to quote the description given in the International Correspondence School Course: "The method recommended is that of Bordier, which may be briefly outlined. The specialist should be provided with a graduated set of copper bougies ranging from 3 to 6 of the French scale, mounted on No. 5 or No. 6 copper wire. These are so fashioned as to fit into ordinary silver Eustachian catheters, which are insulated from tip to mouth. The bougie is to be pushed full length into the catheter until its copper tip protrudes slightly in the opening. The catheter is now introduced into the tube in the usual manner and carried along until the tip meets the obstruction. The wire is then attached to the cathode terminal of the current source and from 2 to 5 milliamperes is passed for 2 to 5 minutes. The operator will now observe that the bougie passes on with greater ease. More of it, therefore, is pushed in and the same quantity of current is administered for 5 minutes. At the end of this time the catheter and bougie are withdrawn together. Duel uses bougies of gold of a length sufficient to allow protrusion for $1\frac{1}{2}$ inches or more beyond the tip of the catheter. This arrangement permits the electrization of the entire canal at once. Better results are gained by the employment of weak currents for a longer period of time than by using strong currents for a brief sitting. It is understood, of course, that electrolysis alone does not constitute the entire treatment. Routine measures, with insufflations, etc., are to be carried out concomitantly.

The sittings should be repeated as often as twice weekly, using a bougie of larger caliber on each occasion, if possible. Daily catheterization and insufflations are advised during the intervals.

"The middle ear should receive proper attention." Even if it be impossible to restore hearing by the reduction of the stricture, the tinnitus which is so commonly present and so persistent is very frequently entirely dispelled."

This procedure is of use more especially in the sub-acute cases with narrowing of the tube at the isthmus. Tinnitus is often relieved.

There are varying opinions as to the value of electrolysis over other methods of dilatation, some strongly affirming that the results are no better than in dilatation by the usual methods. Others speak of the danger of setting up an inflammatory otitis by the use of the bougie, while Dr. J. O. Tansley reports the case of a bougie broken off in the Eustachian tube.

Pneumatic Massage, etc.—Dr. Edwin Pynchon of Chicago recommends pneumatic massage in middle-ear troubles, the air pump being run by an electric motor. Dr. Grant (g) has used with success in several cases mechanical vibration applied to the spine, the instrument consisting of a small motor, on the axle of which is placed eccentrically a brass disk. The instrument is pressed against the spine between the shoulders, and gives a series of slight jars which are probably transmitted to the bones of the middle ear.

An instrument named the Electrophone, manufactured by E. B. Meyrowitz of New York for Dr. Samuel G. Tracy, is constructed like the telephone and so arranged that it magnifies sound.

Dr. Tracy writes me that it is only useful as an aid to hearing and not as a remedial agent, although in cases not too far advanced it might act as a remedial agent by stimulating the functions of hearing into renewed activity.

Mr. Miller R. Hutchinson of New York has manufactured an instrument called the "Acousticon," which is of great value as an aid to hearing to those quite deaf and even to deaf-mutes. He also has manufactured another instrument which is called the "Massacon," which is designed to cause a normal tympanum to move through a maximum amplitude of vibration of one-thirty-second of an inch. The intention with this in-

strument is to so massage the ossicular chain as to have a tendency to restore it to its normal movements.

Dr. George A. Richards of New York writes me that "in many cases of sclerosis the 'Massacon' gives good and sometimes very marked results, always used with other recognized methods of treatment."

Dr. S. H. Monell of New York advises the use of the ear-piece of a telephone stimulated by his high-induction apparatus. He also suggests that the oscillator may be used by massaging along the course of the Eustachian tube with the vibrating finger-tip.

Dr. W. H. King of New York has used massage (pneumatic vibrator) and galvanism simultaneously.

A number of other instruments are made in which electricity is used as a motive power, all intended to restore the normal condition of the middle ear and the natural movement of the ossicles.

Although a great many methods, electrical and otherwise, have been suggested for the treatment of this disease, none have as yet been more than palliative. Dr. Samuel Sexton in 1893 (*h*) "mentions the employment of electricity only to condemn it. He has never seen the slightest benefit accrue from its use."

In the Correspondence School Course, Vol. VI, pp. 18-67, we find: "Electrotherapeutics has failed to establish itself as an available agent in the treatment of deafness." Dr. Samuel G. Tracy of New York writes: "My opinion is that, generally speaking, deafness due to otitis media catarrhalis chronica of ten years' standing is not amenable to treatment by any method, nevertheless efficient methods of treatment may be pursued in these cases, which, while it may produce no marked improvement, it is likely to stop the progress of the disease."

I will now report a few cases with results as given to me by the patients or their families only last week. I have been paying special attention to diseases of the nose, throat, and ear for over sixteen years, and so met with a comparatively large number of cases. Those I selected to report were the worst ones I met with, deaf in both ears, and requiring a loud tone of voice, when five or ten feet away, in order to hear well.

None of these cases had any closure of the Eustachian tube,

excepting perhaps the second one, which was a distinctly catarrhal case in mouth and nose as well as ears. The Politzer bag was not used, as I wished to give the electricity all the credit possible. All of these cases were told to use some simple gargle morning and night, to massage the ear by manipulating the tragus three times a day, and some of the cases to perform Valsalva's method of inflation every morning. In all these cases except the last I used a mild primary interrupted current from a McIntosh battery of thirty-six cells, three times a week, and for ten minutes at a time. Until October 20, 1902, I used a conical electrode in one ear at a time, and the patient held a sponge electrode in the hand. After that date I used a bipolar electrode with conical tips and covered with absorbent cotton moistened with warm water.

Case 1.—L. J. T., shoemaker, forty-six years old; deaf for several years, some tinnitus, calcareous deposit in right membrum tympani. Interrupted current from September 8, 1902, to October 2, 1902. I cannot find him to get a report at the present time, but I remember he thought that the tinnitus was relieved some.

Case 2.—Miss M. E. M., thirty-two years old, works in cotton bleachery; duration of deafness seven years, considerable tinnitus, a general anæmic condition, for which proper remedies were administered. She has one brother and two sisters, none of them deaf, and does not know of deafness in parents or grandparents. Interrupted current from September 13, 1902, to November 14, 1902. Reports in September, 1903, that the tinnitus has disappeared and the hearing is better.

Case 3.—C. A. B., fifteen years old, schoolboy; has been deaf three years; has one brother and one sister, neither deaf; mother is deaf, but father and grandparents are not deaf; has no tinnitus. Interrupted current from October 13, 1902, to April 3, 1903. Reports in September, 1903, that although he heard better (only a little) while treating, that since leaving off he hears no better than before.

Case 4.—Mrs. M. C., fifty years old, housewife; thirty-two years deaf; only child; parents and grandparents not deaf; no tinnitus. Interrupted current from October 23, 1902, to November 21, 1902. Ears felt clearer while treating, no improvement since she left off.

Case 5.—Mr. F. B. B., fifty years old, barber; duration of deafness three years; no tinnitus. Brothers and sisters died when children; father deaf, caused by firing salutes; mother and grandparents not deaf. Interrupted current from January 13, 1903, to April 2, 1903. Reports in September, 1903, that the treatment made him worse.

Case 6.—Mrs. M. W., forty-eight years old, housewife; duration of deafness nine years in right ear and one year in left ear. Has one brother, not deaf; parents not deaf; don't know about grandparents; has two maternal aunts deaf; no tinnitus. Interrupted current from January 17, 1903, to June 25, 1903. She reports in September, 1903, that, although she seemed to hear some better while under treatment, hears no better now.

Case 7.—Mr. A. S. P., forty-eight years old, stable-keeper; had two brothers and two sisters; one brother and one sister died young; those living are both deaf; parents and grandparents not deaf; duration of deafness fifteen years; slight tinnitus only on eating and drinking. He hears the telephone better than those whose hearing is good at the stable. Interrupted current from January 30, 1903, to March 11, 1903, with no benefit whatever.

Case 8.—W. H. F., 13 years old, schoolboy; duration of deafness three years; has one sister, who is slightly deaf; mother deaf, mother's mother is deaf, mother's maternal grandfather is deaf; patient's father has one brother and one sister who are deaf. He has very little tinnitus. Interrupted current from March 14, 1903, to April 27, 1903, had no effect whatever.

Case 9.—Mrs. M. M., twenty-eight years old, housewife; duration of deafness six years; has one brother and three sisters, only one sister deaf; parents and grandparents not deaf. Interrupted current from April 24, 1903, to May 22, 1903. She reports in September, 1903, that the tinnitus, which appeared to grow worse under treatment, entirely disappeared after she stopped treating, and also that her hearing has improved.

Case 10.—Mrs. S. G. C., forty years old, housewife; duration of deafness ten years; has one brother and four sisters, one sister deaf; parents and grandparents not deaf. She has some tinnitus. High-frequency with Dr. Snow's vacuum elec-

trode for the ear, five minutes in each ear, three times a week, from August 18, 1903, to September 16, 1903, has as yet had no effect.

I wish to kindly acknowledge personal help from the following gentlemen:

Clarence J. Blake, M. D., Boston; Eugene A. Crockett, M. D., Boston; G. Lenox Curtis, M. D., New York; Miller R. Hutchinson, E. E., New York; Robert Newman, M. D., New York; George A. Richards, M. D., New York; William Scheppegrell, M. D., New Orleans; Thomas M. Strong, M. D., Boston; Samuel G. Tracy, M. D., New York; Walter H. White, M. D., Boston.

REFERENCES.

- (a) Neiswanger's "Electro-Therapeutical Practice," seventh edition, p. 124.
- (b) Scheppegrell on "Electricity in Diseases of the Nose, Throat, and Ear," p. 334.
- (c) Bishop on "Diseases of the Ear, Nose, and Throat," p. 103.
- (d) Scheppegrell on "Electricity in Diseases of the Nose, Throat, and Ear," p. 330.
- (e) Paper read by Dr. Robert Newman at the Eighth Annual Meeting of the American Electro-Therapeutic Association.
- (f) Scheppegrell on "Electricity in Diseases of the Nose, Throat, and Ear," p. 337.
- (g) Treat's Annual for 1900, p. 174.
- (h) "System of Diseases of the Ear, Nose, and Throat," Burnett, p. 367.

Discussion.

Dr. R. J. Nunn said that the term "ozone" had been used in the paper, and he would like to know whether by this was meant that air had been passed through and electrified.

Dr. Goodell replied in the affirmative.

Dr. Nunn replied that this was not ozone, but nitric acid. Those who wished to satisfy themselves upon this point could go to Niagara Falls and see the nitric acid made upon a commercial scale by this method. For this reason he wished to make a distinction between electrified air and ozone. If oxygen were passed through and electrified, ozone might be produced; if ordinary air were passed through, the result would be ordinary nitric acid. He was unable to say whether there was any ozone present in addition to the nitric acid formed when air was electrified.

Dr. Goodell, in closing, said that he was afraid that the good results he had obtained would not be permanent if the patients relaxed their efforts; however, he would say that in all his previous experience of sixteen years he had never secured such good results until he employed the electrical treatment. It should be remembered that in his cases other methods were eliminated in order to avoid the introduction of confusing elements.

A YEAR'S WORK IN ELECTRO-THERAPEUTICS.*

BY L. V. GUSTIN MACKEY, M. D.

Mr. President, and Fellows of the American Electro-Therapeutic Association:

It is with great hesitancy that I come before the members of this progressive and scientific body to present any topic connected with the vast subject of electro-therapeutics. I have the more hesitated as I have made no new discovery, have instituted no original method of application, invented no instrument, nor made any miraculous cure.

I make no claim as a specialist in this department of therapeutics; though I had in years past used electricity more or less, it was as an adjunct to other remedial measures other than the agent *par excellence* in those diseases which I now find yield most readily to its application.

A few years since I awoke to the fact that much more was being accomplished by others for suffering humanity, in the field of electro-therapeutics, and that a half-hearted interest was not the way to success.

I then began a methodical and persistent use of electricity in such cases as came to me in a general practice in a country town and a small sanitarium under my direction.

I have not found electricity a "cure-all." Some few cases seemingly were made worse, but with care I have seen no ill effects that were lasting.

My armamentarium consists of an eight-plate Holtz induction machine, and forty Leclanché cells supply the electromotive force for the office equipment, while chloride-of-silver cells are used for portable batteries. High-tension coils, millam-meters, hydro-rheostats, and the various electrodes are used for localized and special applications. With this office equipment I have treated 125 cases during the past year.

It is the clinical record of these cases, and the results, failures, and successes, that I present to you.

In many instances these persons were referred to me for sanitarium treatment by other physicians after every means at

* Read at the Thirteenth Annual Meeting of the American Electro-Therapeutic Association, at Atlantic City, September 23, 1903.

their disposal had been found unavailing. Often a letter accompanies the patient asking pardon for sending such a hopeless and unsatisfactory case, adding, "You know we must be doing something to make the patient feel his case is receiving due attention," and the writer advises "to try what good nursing and massage with perhaps a little electricity, baths, etc. may do. This will satisfy the patient and give his family and physician a much-needed rest. "You and I know," he adds, "that the benefit derived from these methods, especially that of electricity, results from the impression made on the patient's mind."

This candid statement of the medical brother, relegating electricity in medicine to a place among the placebos, is not complimentary to either party,—to him least of all who judges without investigation so powerful an agent,—but it very fairly expresses the place allotted to electro-therapeutics by the general practitioner.

I suppose there is at this date no one who hesitates to admit that any unusual or new method of treatment fails to appeal to the ever anxious and eager sufferer seeking relief from mental or physical distress, and that the good resulting from this special department of therapeutics may be due partly to psychical effect, to the imposing appearance of the static machine, to the exhibition of power emanating from the induction coil, to the array of electrodes, and to the evident faith and assurance of the operator that benefit is to be derived.

These impressions are not alone made through an electro-therapeutic outfit, but by every apparatus and all drugs used by the profession, suggestion being a strong factor the value of which we neither deny nor refuse to accept.

Admitting that physical impress is the first step towards a betterment in the condition of a patient, we notice that the impression is almost immediately followed by marked improvement in the majority of cases. The improvement is of such a general or special nature that there is no more difficulty or doubt where to bestow the credit than in other methods. The results sought and obtained are as positive as the relief from pain by the administration of opium.

It would be absurd and unscientific to expect electricity to overcome disease caused or aggravated by certain pernicious habits, therefore before beginning a course of treatment I fully

explain to my patients that no miracle is to be performed, and that no method or physician can compel them to get well; that on their part there must be a willingness to acquiesce. Strict rules are given to correct faulty habits and to regulate baths, exercise, and diet.

When indicated, nature is assisted by mechanical appliances, improved environment, hydro-therapeutics, and drugs. These, however, are incidentals, and do not detract from the value of the electric current as the real means of cure.

The cases treated include hemiplegias, paraplegias, writer's palsy, locomotor ataxia, neuralgias, rheumatism, arthritis deformans. The various pelvic diseases, fibroid tumors of uterus, metritis, ovarian and tubal disease, dysmenorrhœa, amenorrhœa, acne rosa, eczema, hysteria, melancholia, neurasthenia.

The professions were well represented—clergymen, lawyers, physicians, school teachers, shopgirls, but the larger part were housewives.

The typical neurasthenics are familiar to all of us, with the anxious, careworn expression indicative of mental distress. "Like the poor, we have them always with us." They bring a complexity of symptoms so bewildering that at times they almost convince a superficial observer that they are as they firmly believe, the victims of all the diseases under the sun. Nervousness, insomnia, dyspepsia, headache, vertigo, tremors, spinal irritation, vaso-motor disturbance, the phobias, and neuralgic pain are a partial list of their complaints.

In making a diagnosis we have to differentiate between hypochondriasis, melancholia, and other organic disease of the brain, for very many of the symptoms are similar.

We have a means of diagnosis in the current from the static machine,—my experience being that in neurasthenia we see an early and rapid improvement, while the reverse is true in the degenerative forms of insanity.

I am aware that in this statement I subject myself to criticism, because the experience of some others has been more favorable, but I confess to total failure in restoring degenerative brain function by electrization.

The tonic and alterative properties of galvanism would apparently offer the best results, but galvanism has disappointed me. The general health to a certain extent has been improved,

but in nine cases of mental disease treated in the sanitarium, where the patient has been under the most favorable conditions, only two recovered, and in these two credit could not be given to any particular line of treatment. Several were made more excited by electricity and required large doses of some hypnotic to produce sleep. This result may be attributed in a degree to the fear engendered by the formidable appearance and noise of the apparatus.

It is in neurasthenia, where the nutrition of the nerve cells are primarily at fault and which have lost the power of building themselves up with stable compounds and which break down easily under slight irritability and consequently send out but feeble impulses, that we may expect the greatest benefit from the sedative, nutritive, tonic, and stimulant properties of static electrification.

Even in those advanced cases where the nervous tissues of the medulla and central gray matter, as well as the higher centers of the brain, are evidently somewhat involved, judging from predominant mental symptoms, we find recoveries following careful systematic application.

That vascular changes which occur in the nervous system as shown by cerebral hyperæmia and anæmia, digestive disturbances, faulty metabolic processes in the liver and spleen, and absorption of ptomaines into general circulation, are all powerfully influenced by the electrical current, is proved by the return to normal functioning of all the organs of the body.

Frequently we are consulted by neurasthenics who seek relief from symptoms referred almost wholly to one organ or system of the body. Prominent among these we find a large number suffering from symptoms which we broadly designate nervous dyspepsia.

A typical case is that of a physician whose disease had been of long standing and so stubborn in yielding to the usual routine treatment; and his recovery so rapid and conversion so decided that I will read extracts from a letter lately received.

Dr. C. S. Aged fifty, American; active, nervous temperament; family history good; using neither alcohol or tobacco; engaged in large general practice in a country town with all the hardships the term implies. His own words will best picture his condition. He writes: "It is now four months

since my last treatment at your office, and I am glad to report that I am as well and in some respects decidedly better than when last I saw you. I am still careful in relation to diet, but can make a good meal. You asked me to send you some history of my sickness to read before a medical society; I gladly submit the following: I first noticed that I was falling below par both mentally and physically about twelve years since, which I ascribed to a series of overwhelming sorrows and mental shocks. A changed environment brought added cares and responsibilities and the hardest year's work that I had ever had. As a result my digestive apparatus utterly failed me. The symptoms varied, but there were always two distinct periods, one in which there was a normal or somewhat exaggerated appetite and no particular distress, except a feeling of pressure at the epigastrium. This would be followed in two or three hours by such a sinking and distress at the epigastrium and upper abdominal region as to be nearly unbearable; often the distress would amount to a hard pain, and this in turn would be followed by nausea. These feelings could be relieved temporarily by the ingestion of food, and often on my rounds I have had to ask patients for food. This put off for a time the remainder of the symptoms, which were languor, a sense of great fatigue, drowsiness, and a wretched bitter or acid taste, which lasted several days.

"What I learned to consider the second set of symptoms, followed those last mentioned, which were marked by complete anorexia. Small portions of food eaten from necessity were regurgitated, acid, bitter, and mawkish, according to the time which had elapsed. At other times they were vomited just as eaten. A feeling of great restlessness was experienced, a fear of impending disaster, of great irritability, a smothering sensation as though breathing noxious gases, a pressure in the occipital and frontal region which increased to a violent headache, and I felt as though the brain was much too large for the skull and would burst. A girdle sensation around the waist grew tighter and tighter until I became nearly unconscious. Pediluvia, emetics, purgatives, with some one of the coal-tar products, gave relief after hours of intense agony. I could not attend to my professional duties during this period, as all the painful sensations were greatly increased by irregular hours and broken sleep. I began to feel that there must be

some organic disease and placed myself under the care of one of the best specialists in Boston. Examination of stomach contents was made, with negative results. Diagnosis: nervous dyspepsia. The treatment by Dr. ——— consisted of three drops of tr. nux vom. three times per day, after meals, increased until twenty-five drops had been reached, falling to the original dose and again reaching the limit. This I continued for three months, but with no improvement. Becoming discouraged, I began treating myself; sometimes I was better, sometimes worse, till I reached a condition on the verge of despair, with no hope in this life or the next. The pressure at the vertex and pain in the cervice occipital region became almost constant. Dieting and drugs had their share of attention, until I became much emaciated. I think it was in February that I placed myself under your care, willing to abide by any suggestion you might make. I remember that I was greatly amused when you proposed electrical treatment, and I assured you that I was ready to be electrocuted if by this means I could obtain relief. I began with three treatments per week, with all the showers, sparks, breeze, *et cetera*, pertaining to the static machine, but with little hope and less faith.

"The second week of treatment I saw a change. I lost the sensation of pressure at the epigastrium, and the weight and heaviness in the bowels ceased. The second week passed without any accustomed headache, much to my surprise. A feeling of confidence stole over me that had long been a stranger. The mental cloud began to lift, and from that time there has been a gradual and steady improvement. Sixteen weeks have now elapsed since my last treatment, and I have had no return of old symptoms. I have every reason to be grateful for restored health, and you may be pleased to learn that I am so far a convert that at the earliest convenience I shall add an electro-therapeutic outfit to my office equipment. The only drugs given were infus. rhei. twelve ounces, the three bromids aa. two dra., chloroform one dr. A teaspoonful of this mixture was given after each meal for a short time. The duration of treatment was about twelve weeks. The doctor instructed me to eat six small, easily digestible meals *per diem*, avoiding all fruits except bananas, which were scraped and baked and taken with breakfast."

The breakfast cereals, sugars, pork, salted meats, fresh

bread, and made dishes were prohibited, otherwise his diet was unrestricted. He gained seven pounds in ten weeks, and at the time attended to a large practice, and besides, journeyed twenty miles three times each week to my office. I might cite other satisfactory cases, but this will suffice to illustrate work done in this line.

Many of the symptoms attendant upon pelvic disease, such as dysmenorrhea, amenorrhœa, as well as metritis, ovaritis, etc., have yielded to local application from the galvanic and faradic currents.

Young anæmic women suffering with ovarian pain, leucorrhœa, or other conditions arising from an uncertain pelvic disturbance, where local examination is undesirable, are frequently entirely relieved by the current of tension when applied to lumbar and abdominal regions.

In chronic inflammatory states, whether associated with exudative material or not, as well as the above conditions, I have been able to obtain from the use of the hydro-electric instruments as devised by Dr. Margaret Cleaves the best results.

As we are not always fortunate in being able to follow the history of cases treated, and later developments are frequently observed by others, I may perhaps be excused if I give as an illustration the history of a patient not included in the report of the work of the past year.

From Notebook, 1889: Miss D. G. American, unmarried, of good family history, aged twenty-four years. Markedly anæmic, anxious and distressed countenance, presented herself at my office for relief for intense menstrual pain. Holds a position of responsibility requiring great energy and mental acumen, having under her charge some fifty women. First menstruation at fourteen, regular but always attended with pain. After leaving school and engaging in business, the pain increased, the flow decreased, until at time of coming to office the flow was scanty and the pain so severe that she was obliged to spend two or three days in bed each month. The premonitory symptoms were insomnia, mental depression, irritability, pains in back and legs. This condition unfits her for her work and lends a morbid fear to the future, which makes life burdensome.

Physical Examination.—A small retroverted uterus, cervix

eroded, ovaries sensitive, not enlarged. A pinhole os. Attempt to introduce small probe causes intense pain.

Diagnosis.—Stenosis with endocervicitis. Local treatment for several weeks with tonics made some improvement, but the pain at menstruation was not lessened. Rapid dilation under ether was the next step, resulting in marked improvement, which continued for nearly a year, when she returned with all the old symptoms in full force. Examination proved that the pelvic condition was much the same as before dilation.

A second dilation with curettement was made, the cervical fibers were stretched to the limit of rupture, a hard rubber stem was left *in situ* and worn for five months. The pain was so much less that she considered herself cured. However, in three years she returned for the third time with a renewal of the old symptoms. I suggested gradual dilatation and treatment by electricity, which she gladly accepted, thereby enabling her to continue in her position. After three months' tri-weekly treatments she was discharged symptomatically cured, though I hardly dared to hope it would prove permanent. For three years I had her under observation, and during this time she was actively engaged in gymnastics, cycling, etc. She took up settlement work in connection with training for a nurse, and remained well and happy. At the end of this period she went to India as a missionary nurse. This required a clean bill of health. She suffered great hardship during the plague and pestilence in Calcutta. She returned to England to recuperate from India fever; later she became a missionary and worker in the slums of London, crossing the ocean six times. This spring, after fourteen years from my first knowledge of her condition, she reports herself perfectly well as regards her pelvic organs, having continued so since her treatment by electricity.

In treating fibroids of the uterus I have not used the "high currents of tissue-destroying voltage," but have contented myself with the results obtained from those of medium intensity; depending on the restorative and decongestive action on general and local nutrition.

I believe we have in the galvanic current (in competent hands) a "rational and scientific remedy, free from danger" when used with due regard to details as in other surgical procedure; in many instances it enables us to avoid the more or less dangerous cutting operations on the pelvic organs. Personally I have no experience with high currents. In the cases in which I have had success, the women were near the climacteric and were suffering from hemorrhage, pressure, and reflex symptoms. For various reasons operation was unad-

visible, but at the present time all remain symptomatically well or very greatly improved.

In several instances patients have decided upon operation for removal after electrical treatment, and I have been able to demonstrate that no adhesion or degeneration had resulted from its application, notwithstanding much has been said to the contrary by those who oppose its use.

These two groups, diseased conditions of pelvis and nueras-thenia, comprise by far the larger number treated, but I have had most satisfactory results in the often long protracted convalescence following surgical operations, septicæmia, diphtheria, etc., in a few of the skin diseases, some forms of eczema, acne, and one case of herpes zoster, in recent palsies and myalgias, but the limits of this paper will not allow of more than a reference. Very little benefit has been noticed in arthritis deformans, though in a few cases the pains were temporarily allayed; this is the more disappointing if we accept the nervous theory of the disease. In a case of locomotor ataxia, the clergyman was much benefited by the Franklinic current. If discontinued for any length of time he loses ground. In his case it seems to keep the disease from progressing according to the general rule.

In these hundred and more cases treated with electricity as the prominent therapeutic agent, I cannot give the reason for success in certain individuals and its failure in others under apparently similar conditions. I do not know why in one patient success is obtained from low currents and why others require high currents, nor why one patient cheerfully submits to from fifty to eighty milliamperes while another objects to ten; neither can I explain why similar idiosyncrasies are observed in medical therapeutics. In this paper I have considered the details of application as superfluous, and I know that the number of cases is not sufficient to prove the curative value or the reverse. I have simply related the result of my experience in diseased conditions, with the hope that to you who are pioneers in electro-therapeutics these remarks may not seem entirely futile, and that to others who perhaps may be in the first stages of experience they may be suggestive of help.

Discussion.

Dr. Marcus M. Johnson said that after listening to this paper, in which the patients treated presented the common symptom of nervous distress, one was struck with astonishment at the ease with which static electricity gives relief. In his own experience this had been almost uniformly the result, and it had been quickly attained. Reference was made to a case of exophthalmic goiter in a person fifty years of age presenting excessive nervous symptoms. For the past few years she had been unable to lie down. He had been greatly surprised after the third electrical treatment.

THE RELATION OF MECHANICAL VIBRATION TO THE NERVOUS SYSTEM.*

BY ARNOLD SNOW, M. D., NEW YORK.

Mechanical vibration, or vibra-massage, has made rapid development during the past few years. It is the outgrowth of a subject which dates back to ancient times,—one which has been maturing for centuries, and which has been practiced by many nationalities in various ways,—to wit, massage. Until recently, however, massage has not received the recognition it so richly deserves, for in the hands of charlatans and quacks—non-professional masseurs—it has principally become known, and not favorably known. It required such men as Mezger, Zabludowski, Bunge, Graham, Seguin, Weir-Mitchell, Playfair, and Kellogg to give it scientific recognition and establish a technique that could be therapeutically employed.

The history of mechanical vibration is limited, but much can be learned from its development in relation to massage.

The word massage is from the Greek *μάσσω*, to knead; Sanskrit, *Makch*, to strike, to press, to condense; and according to Graham includes "*friction, kneading, manipulating, rolling, and percussion of the external tissues of the body in a variety of ways, either with a curative, palliative, or hygienic object in view.*" Friction, percussion, and rolling, a form of kneading, are produced by the action of many of the mechanical vibratodes.

Mechanical vibration, or vibra-massage, in the modern sense produces vibration as understood by physicists—"a recurrent change of position," whether that motion be to and fro in one plane, up and down, percussory, oscillatory, mixed, recurrent, or rotary. When a vibration is induced through connected particles of matter a succession of waves are set in motion which form a line known as the *wave-line*. From a fixed point on one wave to a corresponding point on the next is one *wave-length*. When several wave-lengths send impulses throughout a given area, motion from each follows, resulting in *interference* which may *increase, decrease, or inhibit* motion. It may cause areas of different degrees of vibration, and in

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membranes, etc., it may result in vibration in segments or stationary vibrations, the points of least vibration being called *nodes*, the points of greatest motion *antinodes*, and the portion between two nodes a *ventral segment or loop*. The resultant wave will be longitudinal if the particles in vibration and the wave path be in the same direction, or transverse when they are in opposite directions. The rapidity of wave transmission is increased with the *increase of the elasticity of the medium*, as it more easily transmits "waves made up of condensations and rarefactions," hence the elasticity of the region treated will influence the effect. Therefore, with a given rate of vibration one tissue or organ may have few waves transmitted in a given time, whereas another may have many consisting of nodes, antinodes, and loops produced with marked rapidity, under which conditions physiological *inhibition* may be induced instead of *stimulation*. It is also possible, in an organism so intricate and complex as the human body, that *sympathetic* vibrations may be elicited in certain parts in harmony, *i. e.*, having the same periods of vibration. When the vibration period peculiar to a particular part is not recognized, mechanical vibration may cause *forced vibrations*,—that is, "the vibratile body is compelled to surrender its non-vibration period and to vibrate in an arbitrary manner imposed upon it by another."

The study of *harmonic vibrations* is a field yet requiring much investigation; but in connection with it, it must be remembered that an increase in the number of vibrations shortens the wave-length and increases the pitch, and that "the vibration frequency of strings of the same material varies inversely as their lengths and the square roots of their weights and directly as the square roots of their tension."

The following forms of vibratory treatment are recognizable:

(1) *Interrupted vibration*—An interrupted vibratory impulse communicated to the body without pressure in the form of *superficial interrupted vibration* or *deep interrupted vibration* of which compression is a feature.

(2) *Stroking*—A superficial vibratory impulse applied with motion over a part, no pressure being exerted—is generally applied against the venous flow, but may be otherwise applied in respect to direction as indications warrant. This mode of application differs from that of manual massage in that, while

a particular direction may be pursued, the vibratode in use at the same time has *its* particular action to and fro in one plane, percussory, or rotary.

(3) *Friction* is deep vibratory impulse applied with motion over a part, varying degrees of pressure being used, the subdivisions according to direction being centripetal, centrifugal, and circular.

(4) *Rolling* is forward and backward movement of a part over underlying structures. It is a form of kneading.

The *operating room* should be well ventilated and warm, about 75° F., because the chilling of a patient causes unnecessary discomfort and induces a state of muscular contraction, whereas all parts during treatment should be relaxed or in a state of repose.

The *furniture* necessary will depend partly on the type of machine used. In general, a long, hard table the height of an operating table, which can be elevated at either end, is desirable. Two adjustable arm-rests are almost necessary if the operator has no assistant, as the best work can only be accomplished when all parts are in a state of relaxation.

If the patient be a woman, and is to lie down for treatment, she should remove waist, corsets, and in fact all clothing about the upper part of the body except the undervest, which in certain cases should have loose, short sleeves, as when vibratory friction is to be applied to the arm.

It is best to cover parts not being treated. All waist bands of the underwear should be loosened, so as not to interfere with circulatory activity and to allow the tissues to be in a generally relaxed state. If a man is to be treated he should remove coat, vest, suspenders, collar, and outer shirt, and in all cases whatever other clothing necessary, so that vibration may not be interfered with.

Interrupted vibration may be used over an intervening medium, but *mechanical stroking, friction, or rolling* cannot be thus administered satisfactorily. The work should be done in a most thorough and systematic manner, with due regard to technique, and no part should be left undone until finished, opposite portions of the body being best treated successively, as it is thought thus by some to "intensify the effect upon the nerve centers." All treatments should be mild at first, then gradually increased in pressure and speed, and finally finished with diminishing motion.

The patient's posture during treatment should depend upon the indications of the individual case. The position should be always such that the part treated will be *relaxed*, the patient *comfortable*, the vibration *easily applied*, and a *posture* that will best assist in securing the end desired, therapeutically.

It is desirable that the patient should *rest* on the table for a short time after treatment, and then arise slowly in order to maintain a state of absolute repose and composure, so as to avoid the disturbing factors which follow sudden change from a horizontal to an upright position. The rest assists the "fixation and perpetuity" of the vibratory effects.

The first treatment should be short, in order to accommodate gradually the tissues and the patient.

Although there are many who advocate treatment upon alternate days, it is better practice "to bridge the condition of relief from treatment to treatment, lessening the frequency as the requirements permit."

Many of the failures causing such remarks as that "vibration gives temporary relief, but I have seen no cures, and will not give it much consideration until I do" are caused by lack of attention to the technique as regards the *mode of application, duration of application, speed, stroke, pressure*, and a non-observance of "bridging."

Speed, stroke, and pressure are important factors to be considered in connection with mechanical vibration. As a rule a low rate of speed with a sufficiently long stroke has a sedative effect on pain, whereas a high frequency with a medium or short stroke has a benumbing, tetanizing effect. But stroke can only be considered in a relative sense, for a medium stroke of one machine corresponds to a stroke much shorter than the medium of another. Effects produced by light, moderate, or heavy pressure are modified by the length of stroke and rate of speed relative to the part to which it is applied. What *causes stimulation of one part of the body will induce inhibition in another*, other things being equal.

(1) Under all conditions *pressure* increases penetration and diffusion.

(2) To increase or lessen *speed* with a *given stroke* will increase or lessen penetration and affect the quality of vibration.

(3) An increase or lessening of *stroke* with a *given speed* increases or lessens penetration and affects diffusion.

Too much attention cannot be given to technique, as failure or success so often depends on the method employed.

Pressure as applied to vibratory therapy may be designated as light, moderate, or heavy pressure exerted by the hand of the operator.

According to some, "pressure is transmitted variably according to the resisting power of the tissue to which it is applied—to its vitality and to its mass. Pressure of *given quantity* deranges molecular integrity, alters equilibrium, and so engenders irritability and instability. Pressure of *given intensity* produces molecular inertia and death. According to the *nature of the pressure* applied and the *resisting power* of the tissue operated upon, so do we get changes in such tissue of molecular activity and irritability, or molecular derangement and death." *Light pressure* on the trunk of a nerve acts as a stimulus and is transmitted to the nerve. Continued *deep* pressure applied to a nerve induces sedation, as it benumbs and may essentially paralyze the nerve, and probably at the same time lessens the blood supply of the part.

In the employment of vibration, moderate pressure is recommended to nerves over the motor points or between the transverse processes on each side of the spine alternately, but many factors should be considered before the operator decides upon the degree of pressure to apply. Tolerance to pressure increases during an administration, and during the progress of a course of treatment. If *too great pressure be used, nausea, weariness, or pain* may result. As Dr. George H. Taylor, the noted pioneer on vibratory work, said, "The degree of force of processes applied must be apportioned to the degree of irritability of the different parts of the body and must be the greatest to the least irritable parts. Sensitiveness to impression is an approximate measure of irritability." Luderitz found that motor nerve fibers are paralyzed sooner than sensory by continuous pressure.

"All of the single or combined procedures should be begun moderately, gradually increasing in force and frequency to the fullest extent desirable, and should end gradually as begun."

Dubois-Reymond taught that "the nutritional effects depend not on the *quantity* of the electricity, but upon the *variations* in the quantity and the *suddenness of the variations*," which

is true as applied to vibration, but requires qualification in various features of administration. Of mechanical vibration it may be said:

(1) The vibration should possess the necessary rapidity and length of stroke, and *exerted pressure must be such as to be painless.*

(2) The rapidity, stroke of pressure or non-pressure should be governed by the indications and the patient's reactionary resistance.

(3) The interruptions when using interrupted vibration should be limited in number to avoid exhaustion in nerve power.

(4) The intervals of rest should be two or even three times as long as the period of impulse contact, to assist in the perpetuity and fixedness of the effect.

(5) The periods of contact and rest should be rhythmical in the administration of interrupted vibration.

(6) Vibratory effects should be to aid or promote functional activity of a part without altering the integrity or unfavorably affecting its normal activity.

Vibration has a marked effect on respiration, digestion, absorption, heat production, secretion, excretion, the nervous system, the muscular system, and all physiological processes which are affected by active change, as has been said. This being the case, it is necessary that the anatomical relations, the physiological function, the blood, nerve, and lymph supply of each organ or part of the human body be thoroughly understood in order to more fully appreciate faulty technique, for too often vibratory work is *misdirected, energy is misspent, and mechanical vibration or the particular vibrator used is condemned.*

Mechanical vibration, in accordance with the rapidity of speed used, the length of stroke, and the degree of pressure,—light, moderate, or heavy,—may affect every tissue and organ in the body in various ways, included under the following natural processes:

I. *Mechanical.*—It induces the removal of extravasations, lymph, exudations, and transudations, breaks up adhesions, and stimulates the circulatory and lymphatic systems. It improves respiration, stimulates excretion and secretion, relaxes contracted parts, and contracts relaxed parts.

II. *Chemical*.—It assists in the interchange of O₂ and CO₂ and in the increase of certain waste products, as sarcolactic acid.

III. *Thermal*.—It causes the generation of heat: vibratory friction increases *heat elimination*, and deep interrupted vibration with moderate or heavy pressure by acting on muscles increases *heat production*. Cutaneous and vaso-motor stimulation affects the storage of heat, for "When the skin and its blood *vessels contract*, the heat evolved is diminished, when they *dilate it is increased*." If stimulation of sensory nerves causes the circulation to be accelerated, the respiration increased, and the skeletal muscles relaxed, "the temperature of the interior of the body and rectum is increased." If the circulation is retarded, respiration decreased, and the skeletal muscles contracted reflexly, "the temperature of the interior of the body and rectum is diminished" (Landois and Stirling). "External parts give off more heat than they produce, so that they become cooler the more slowly new blood flows into them." Internal parts give up heat "to the blood which flows through them," so acceleration of blood flow decreases their temperature (Liebermeister), (Landois and Stirling). "An increased temperature means an increase in heart-beats," according to Liebermeister.

" Pulse-beats per minute.	78.6	91.2	99.8	108.5	110	137.5
Temperature in C.....	37°	38°	39°	40°	41°	42° "

—Landois and Stirling.

IV. *Physical*.—It assists endosmosis of the lymphatics and the physical action of respiration.

V. *Metabolic*.—It induces anabolic or katabolic changes affecting the functional activity of a part, as in the removal of stasis and an increase in the nutrition of a poorly nourished muscle.

VI. *Reflex*.—It induces activities and changes in related parts through the nerve stimulation of the central and peripheral parts of the cerebro-spinal and sympathetic systems, as in its action as a sedative.

The following, by Dr. George H. Taylor, is of interest:

"The analysis of *transmitted motion into its factors*, and the discrimination of the separate, distinct effects of these, is of direct consequence for estimating the *influence of different rates of rhythm or length of motion-waves transmitted*.

"We may presume that the *heat involved* must pretty closely correspond with the rectilinear extent of the motion and the accompanying pressure, whatsoever the length of the waves. On the other hand, the *chemical products* are in the proportion to the *number of changes* of direction into which this imaginary direct line of motion is broken up, for every concussion which accompanies changes of direction throws off energy in the chemical form, doubtless increasing the oxidation and other chemical changes to which all constituents of the organism are by nature destined, and the promotion of which all curative processes must include.

"But the evidences derived from chemical analogies and chemical facts are by no means the conclusion of the array available. Those ordinarily satisfactory are abundant. These are clinical tests. The peculiarity of this class of evidence of chemical effects consists in *removing obstinate local and general manifestations of disease*, for which the most potent chemical remedies are commonly employed with far less conclusive success. This effect of rapid wave or vibratory motion shows that profound chemical changes are superinduced by the means used, which in this case can only be liberation of chemical energy in contact with material having unstable equilibrium—the non-vital suboxides."

There are certain indications for the vibratory treatment of spinal nerves, and there are conditions and times *when* and *where* there is a question as to the advisability of inducing additional stimulation.

The unit of nerve tissue is now recognized as the neuron, or neurone, consisting of "the nerve cell, neurocyte or corpus, the axon or axone, or nerve process, and the end tufts or terminal branches.

Starr classifies them as:

(1) Primary neurones whose axone goes to the periphery, namely to a gland, the skin, a muscle, or a sensory organ.

(2) Secondary neurones whose axones end "about a primary neurone or about another secondary neurone."

The primary neurones are concerned in reflex acts, but both primary and secondary neurones govern voluntary movements and conscious sensation.

What concerns us particularly is the *nutrition* of the nerve as it is affected by various pathological conditions and has a

direct bearing on nerve stimulation. It was first noted by Hodge that the *cell and nucleus changed if active*. Was noted that a *mild stimulation* caused the cell to swell and clear up in the center, and "Mann showed that *functional activity of the cell was accompanied by an increase* in the size due to *inhibition of the lymph* lying in the cavity about the cell, so that the cell at work fills up the cavity in which it lies. When activity goes on to the point of fatigue, then a shriveling of the cell begins, first in the nucleus, then in the body." These changes were caused by various stimuli, both electrical and mechanical, as running. If the cell that has been stimulated be given sufficient rest, it will revive and resume its functional activity, but it is necessary that the blood supply be perfect and that the blood contain no deleterious substances. There may be an injury to the neurone of a character which cannot be repaired and which will lead eventually to organic nervous disease. According to Starr, *bacteria* as well as *leucocytes* may be found in the neurone body.

The spinal cord is supplied with *blood vessels* which are non-anastomosing terminal arteries. If an embolus occurs in such an artery "an area of softening" results. Starr believes that too little attention has been given to diseases of spinal blood vessels and "to the results of endarteritis, and cases of supposed myelitis have been found to be softening of the cord due to thrombosis in diseased blood vessels." These facts must be taken into account when using vibratory stimulation.

The spinal cord controls various voluntary and involuntary actions of the human body. Nerve centers for many of these functions have been discovered, but others are as yet unknown or in doubt, some authorities claiming one, and some another, region to be the center for a certain act or impulse, and yet again in some instances experiments have been made on the lower animals resulting in the discovery of certain centers which have not as yet been verified in respect to man.

"While the *vaso-constrictors* arise from a limited but extensive area of the cord, the *vaso-dilators*, at least so far as they have been investigated, are said to arise from a wide area, which, unlike that of the *vaso-constrictors*, is not limited chiefly to the thoracic region of the cord, but, on the contrary, there is a copious outflow of these nerve fibers from the cranial and sacral regions of the central nervous system. In fact, it

would seem that vaso-dilator fibers arise from all parts of the spinal cord. *Stimuli which are applied at long intervals to the nerve act especially on the vaso-dilator fibers; while tetanizing stimuli act on the vaso-motors*" (Bowditch and Warren).

Stimulation of pressor and depressor fibers of "different afferent nerves" excites or inhibits the action of vaso-motors. Loven believes that "the first effect of stimulating every sensory nerve is a pressor action," and S. Mayer and Pribram found that "mechanical stimulation of the stomach, especially of its serosa, caused pressor effects."

According to Brubaker, stimulation of the anterior roots of the spinal nerve causes:

- (1) Convulsive movements of muscles.
- (2) The formation of a secretion in glands.
- (3) Inhibition of the rhythmic activity of certain organs.

Stimulation of the posterior roots causes:

- (1) Reflex activities.
- (2) Conscious sensations.
- (3) Inhibition of the rhythmic activity of certain organs.

The *reflex activity* is what some authorities consider to be of the greater importance, as it is believed that in chronic visceral diseases "the spinal muscles lying over the reflexly affected spinal nerve centers will generally be found *contracted*, and if long continued more or less *atrophied*," and that stimuli "applied directly over the affected center" acts as a *vis a tergo* to restore normal functioning power, and therefore interrupted vibration with the ball is used on each side of the spine between the transverse processes. When the ball is thus applied it is in close proximity to the cutaneous branch of the internal branch of the posterior division of a spinal nerve, and the sympathetic is reached by the efferent branch and rami communicantes communicating with the spinal nerve and the sympathetic ganglion.

When the *motor nerves* of the arterial system are stimulated, a lessening of the caliber of the blood-vessels results. If the central end of a sensory nerve be stimulated, as of the sciatic, it causes a *rise in the blood pressure*. Strong mechanical stimuli lessen the action of vaso-constrictors and cause a *dilatation* of the arteries, with sometimes a preliminary contraction. Stimulation of the vaso-motor nerves supplying the

blood-vessels may be based on the following: the blood-vessels of the head are supplied by the cervical sympathetic, of the upper extremities "through the anterior roots of the middle dorsal nerves into the thoracic sympathetic and upwards to the first thoracic ganglion, and from thence through the rami communicantes to the brachial plexus" (Schiff, Cyon); of the lower extremities "through the nerves of the lumbar and sacral plexuses into the sympathetic and from thence to the lower limbs" (Pflüger, Schiff, Cl. Bernard); of the skin of the trunk through the dorsal and lumbar nerves of the lungs "from the dorsal spinal cord through the first thoracic ganglion" (Brown-Séquard, Fick and Badoud, Lichtenheim); of the abdominal viscera from the splanchnics" (v. Bezold, Ludwig, and Cyon), (Landois and Stirling). Loven thinks that the first effect of stimulating a sensory nerve causes a pressor action. If the stimulus be very slight, it lowers the cutaneous temperature and lessens "the volume of the corresponding limb, sometimes increase of the general blood pressure, and change of heart-beat. The *body temperature* and *even the body weight* are through stimulation of particular vascular areas acted upon by the vaso-motor nerves. Stimulation of a motor nerve or the spinal cord causes not only the contraction of the corresponding muscles, but also dilatation of their blood-vessels (C. Ludwig and Sezelkow, Hafix and Gaskill), the dilatation of the vessels taking place even when the muscle is prevented from shortening."

In applying vibration, take as a rule that, "stimuli which are applied at *long intervals* to the nerve act especially on the vaso-dilator fibers, *while tetanizing stimuli* act on the vaso-motors. The latent period of the vaso-dilators is longer and they are more easily exhausted than the vaso-motors" (Bowditch and Warren).

Reich has divided the movement into vibration and concussion—vibration,—which is of higher frequency and a milder form of movement, and concussion, which is stronger with less frequency. He states that we have reason to believe that small excitations of long duration have the same effect upon the nerves as strong applications which only work once.

It has been demonstrated "that there is an exchange of materials within the nerves, which is proved by the fact that after compression of the blood-vessels of the nerves the *ex-*

citability of the nerve falls and is restored again when the circulation is re-established." Mechanical stimuli act when sufficiently rapid to cause "a change in the nerve particles. Their effects vary; if the pressure on a mixed nerve be continuous, the motor fibers are paralyzed sooner than the sensory. If the pressure be increased gradually an increase of excitability follows, to be later followed by a decrease. According to Kronecker and Zederbaum, pressure applied to a mixed nerve abolishes *reflex conduction* before *motor conduction*. Fontana (1758) found that a stimulus increased very gradually caused the nerve to cease to be excitable without showing *stimulation signs*. A mechanical stimulus does not cause the nerve to become acid. Strong stimuli cause fatigue, but the fatigue does not extend beyond the part treated. Slight pressure without tension increases the excitability, which again diminishes after a short time. The *mechanical work produced* by an excited muscle *in consequence of a stimulus was one hundred times greater* than the *mechanical energy* of the *mechanical nerve stimulus*."

It is also well to recall Pflüger's "avalanche theory," which, although incorrect, makes us remember that the nearer the nerve center the greater the excitability,—that is, a muscle that contracts with a given stimulus at a given point will answer with a greater contraction if the same stimulus be applied nearer the spinal cord. Yet another point to be noted is that *in the same nerve a stronger stimulus* is required for it to act on some muscles, as of *extensors*, than on others, as flexors, as has been demonstrated on the sciatic nerve of a frog. This has not yet been fully investigated, but furnishes a field for study the results of which may ultimately aid in estimating the degree of stimulation indicated for various groups of muscles which it may be advisable to affect.

If stimulation be *continuous and excessive*, fatigue, followed by exhaustion, results. Bernstein demonstrated that "a nerve trunk is more slowly fatigued than a muscle, but it recovers more slowly," which suggests a judicious employment of vibratory stimulation according to the case treated, that overstimulation be avoided.

Nerves are capable of carrying impulses even after there is loss of excitability. We should not, therefore, stimulate a nerve *too rapidly* in order that the nervous impulse may be

allowed to travel without interruption. The impulse travels in a *motor* nerve at from "100 to 120 feet per second, as found by v. Helmholtz and Baxt," and from 90 to 280 in *sensory* nerves, as shown by v. Helmholtz. It is less in the *visceral* nerves, being but 26 feet in some branches of the vagus.

In connection with the subject of *reflexes*, the question arises whether the spinal cord is or is not stimulated when we stimulate the posterior roots. As the spinal cord conduces to the brain impulses communicated to it from the stimulated posterior roots, but does not itself respond to stimuli which produce sensations, Schiff has applied to it the term "*æsthesodic*." Further, as the cord can conduct both voluntary and reflex motor impulses, without however itself being affected by motor impulses applied to it directly, he calls it "*kinesodic*." Many others believe that *direct stimulation will excite* the spinal cord.

Reflex time, or the time for carrying impulses by means of the afferent nerves through the cord to the efferent, lessens as the strength of the stimulus is increased, "and may even become of minimum duration."

Weber and Fechner studied the relation "between the *intensity of stimuli and the change in the quantity of the resulting sensations*." The result depends on (1) the strength of the stimulus and (2) the degree of excitability. Supposing the latter to be constant, while the former is varied, it is found that if the stimulus be doubled, tripled, or quadrupled, the sensation increases only as the logarithm of the stimulus,—that is, "a stimulus increased 10 will increase the sensation 1, or a stimulus increased 100 will increase the sensation 2.

The following table gives approximately the constant proportion for each sense:

Tactile sensation.....	1:3	Muscular sensation.....	6:100
Thermal "	1:3	Visual "	1:100
Auditory "	1:3		

Fechner's "*psycho-physical law*" refers to *homologous stimuli*, "stimuli for whose action the sense-organs are specially adapted," and, according to Landois and Stirling, "holds good only with regard to stimuli of medium strength." *Heterologous* stimuli (mechanical, electrical) act upon the nervous elements of the sensory apparatus along the entire

course, from the end-organ to the cortex cerebri. The homologous stimuli, on the other hand, act *only on the end-organ*.

Scientific investigation is of importance to all employing vibratory stimulation of whatever form—static wave-current, high-frequency currents, or mechanical vibration.

The subject of *referred pain* is of considerable importance in respect to mechanical vibration. It has been studied by Ross, Head, Dana, Starr, and others. Starr says, "they are referred by consciousness not to their actual point of origin, but to the part of the body from which sensations usually come when received at the particular segment irritated," as pain over the outer side of the hips is usually due to ovarian congestion. James Ross suggested that the pain is in such cases "referred to parts supplied by sensory nerve fibers ending in the same segments of the cord as do the afferent fibers of the viscus diseased. Referred pain will occur in the skin areas of those roots which have white rami, of those from which the pelvic nerves arise, and of those nerves, if any, with which the vagus afferent fibers are intimately connected. And there should not be primary referred pain in any other skin areas."

Head in Schafer's physiology gives the following:

Heart.....	1, 2, 3 thoracic
Lungs.....	1, 2, 3, 4, 5 thoracic
Stomach.....	6, 7, 8, 9 thoracic
Intestines...	9, 10, 11, 12 thoracic
Liver and gall bladder.	7, 8, 9, 10 thoracic
Kidney and ureter....	10, 11, 12 thoracic and 1 lumbar
Bladder.....	2, 3, 4 sacral, 11, 12 thoracic, and 1 lumbar
Uterus	10, 11, 12 thoracic, 1 lumbar, 2, 3, 4 sacral
Rectum.....	2, 3, 4 sacral

Another important factor is the effect of stimulating "sympathetic nerves on the one hand, and of the cranial and sacral autonomic nerves on the other, in the regions of double supply, as for instance:

<i>Tissue</i>	<i>Effect of stimulating the cranial and sacral fibers</i>	<i>Effect of stimulating the sympathetic fibers</i>
Heart	Inhibition	Increase in rate and strength
Blood ves. of anal mucous membrane and ext. generative organs.	Dilatation	Contraction

The range of application of mechanical vibration to therapeutics is far greater than is generally appreciated by the profession at this time.

It has its particular field of usefulness and its limitations as every other therapeutic measure.

By removing exudations, extravasations, transudations, and stimulating the circulatory and lymphatic systems, by assisting in chemical changes, by influencing heat elimination and production, by its physical and metabolic effects as well as its reflex action through the nerve stimulation of the cerebro-spinal and sympathetic systems, it can be readily appreciated that the diseases to which it is not applicable may be more easily enumerated than those in which its use is indicated.

But vibration is not alone indicated in many conditions. In combination with *static electricity*, *hydrotherapy*, *phototherapy*, *thermotherapy*, and, most valuable of all, properly selected and graded *exercise*,—passive, active, assistive, or resistive,—it can far more ably care for many conditions than the old methods of treatment.

The wise physician of to-day devotes himself, not to one line of treatment, but many. He studies each most carefully, and selection and election are points of fine discrimination. Each physical measure so employed has its peculiar features of *induction*, mode of *application*, *adaptability*, and *indications*, and among the foremost of those measures which no advanced physician can ignore is mechanical vibration.

465 Lexington Ave.



REPORT OF THE COMMITTEE ON CURRENT CLASSIFICATION AND NOMENCLATURE.*

(Continued from page 357.)

"INDIRECT SPARK."

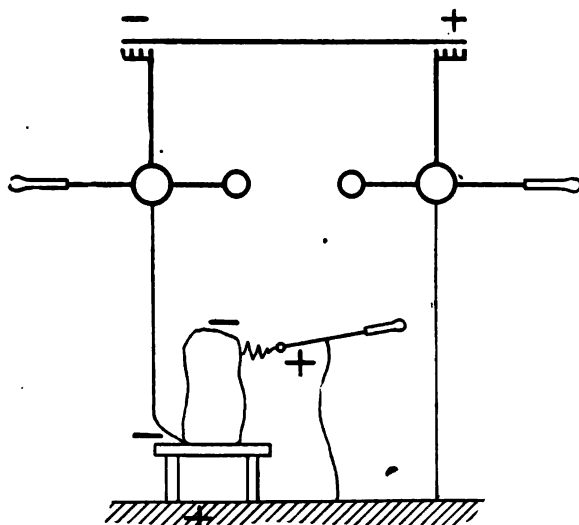


FIG.N

This arrangement is stated to result in phenomena modified materially from those of arrangement M. One prime conductor and the patient jointly constitute one plate of a condenser; the other prime conductor and the earth constitute the other plate. When the movable electrode is at a considerable distance from the patient, the greatest static strain is between the lower surfaces of the patient on the one side, and the floor on the other. As the movable electrode is gradually approached toward the patient, the general position of greatest dielectric strain shifts more and more from the region between the patient and ground underneath to the region between the patient and the electrode, until the strain becomes so concentrated and thereby increased at the latter point that the

* Read at the Thirteenth Annual Meeting of the American Electro-Therapeutic Association, at Atlantic City, September 24, 1903.

dielectric air breaks down, and a spark passes as often as the discharging knob approaches within the critical distance. The larger capacity secured by contact with the earth increases the volume of the discharge, as is shown by the thickening of the spark.

The application of this arrangement may be modified by rubbing the electrode over the patient's clothing, and thus obtaining the so-called (but misnamed) "friction spark," which is simply a succession of sparks of short length giving the sensation of needle pricks.

APPENDIX—OCTOBER 24, 1903.

MORTON'S "SOLENOID-CONDENSER-RESONATOR.*

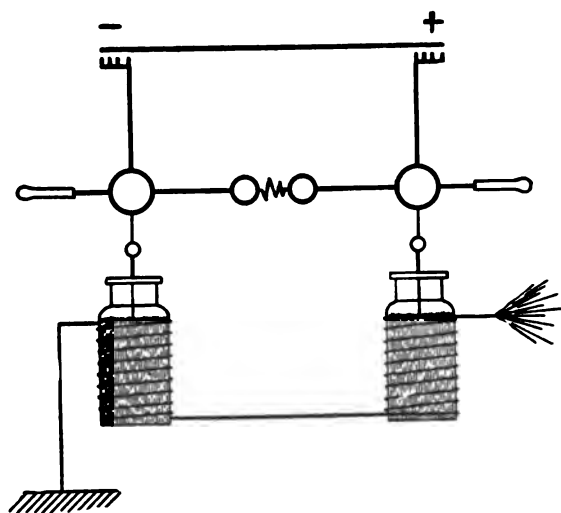


FIG.0

Since the foregoing report was read at the Atlantic City Convention, the Committee has been informed of another arrangement, devised by Dr. W. J. Morton, for producing cur-

* This device of Dr. Morton was briefly mentioned as early as 1888, by Ranney, who, in his published *Lectures on Nervous Diseases*, p. 675, said: "He [Dr. Morton] has also been experimenting of late upon the effects of deriving currents for medical purposes from a helix of insulated wire wound upon each of the Leyden jars of a Holtz induction machine."

rents of very high frequency and potential. It is shown in its simplest form in Fig. O, and in a proposed modified form, in Fig. P.

As shown in Fig. O, the inside coatings of two large Leyden jars are respectively connected with the prime conductors of a static machine (or secondary terminals of an induction coil) between the knobs of which a discharge is passing.

The usual outside coatings of the jars are replaced by coils consisting of a large number of turns of fine copper wire wound in series in the manner shown in the diagram, with the turns well insulated and separated to prevent short circuits from one turn to another.

One end of the coils is grounded. From the other end a strong brush discharge issues. The coils act as outside condenser coatings on the jars, in which, therefore, static electrical charges are induced, and also as resonators, the resonator action imparting a very high potential to the high-frequency currents set up in the coils when the static charges in them are set free by the discharge of the inside coatings of the jars across the spark gap, between the discharge knobs of the prime conductors. The effects produced may be augmented by connecting an extra resonator of the ordinary type with the free end of the coils.

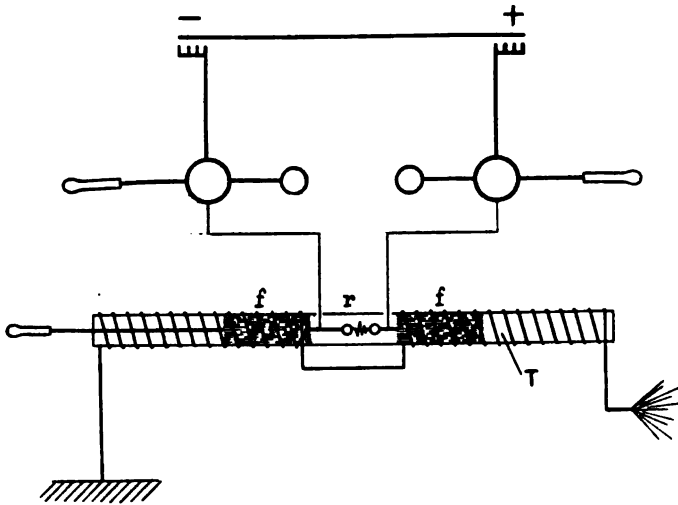


FIG. P

In the modified arrangement shown in Fig. P, the spark discharge takes place between a secondary pair of knobs

secured within a glass tube, T, preferably long and of large diameter.

The entire length of the tube, excepting that outside the region, r , (which has a length, say, equal to three times the diameter of the tube), within which region the discharge knobs are located, is wound with a coil of fine wire in the manner shown.

On either side of the region, r , the inside of the tube is coated with tinfoil, f , for a distance about equal to the length of r . The remainder of the tube, on either end equal in length to about one and one-half times the length of r , is not coated. The discharge knobs are respectively connected with the two tinfoil coatings, one of the knobs being adjustable and the other fixed. One end of the coil is grounded and the brush discharge takes place at the other end. Those parts of the coil that surround the tube at f act as condenser coatings and also as resonators; the parts of the coil beyond f act as extra resonators to still further increase the potential.

Another device, due to Dr. C. O. Files, has also been brought to the Committee's attention, which is claimed to give rise to currents of very high frequency for application to the patient.

A description of the device was published in the Medical Record, April 18, 1903.

About twenty brass balls, 1-2 inch in diameter, are fixed in a row to the outside of a tube of mica, T, by means of screw-threaded projections, extending into the interior of the tube, and placed just far enough apart to give a very short spark gap between neighboring balls. Regulation of the strength of the current, by varying the number of these short spark gaps in series between the prime conductors of the static generator, is effected by short-circuiting any desired number of gaps by means of the metallic sliding rod. The inept term "interrupter" has been applied to this device; it is not a circuit breaker.

The discharge knobs of the machine are drawn so far apart that no spark passes at that point, and the entire discharge is compelled to pass along the balls, through the series of short gaps between them.

The inside coatings of two Leyden jars of small capacity are respectively connected with the prime conductors and terminals of the "interrupter." The outside coating of one jar is connected to earth, and that of the other jar with the terminal of a vacuum tube, by which the current is applied to the patient.

It is evident that the patient may either be on an insulating platform, as shown, or connected with the ground.

It is claimed that this apparatus is an exceptionally active generator of ozone.

PHYSICAL MODALITIES AS ADJUVANTS IN THE
TREATMENT OF TUBERCULOSIS.*

BY J. D. GIBSON, M. D., DENVER, COL.

Member of the Denver Medical Society, Colorado State Medical Association, American Medical Association, American Electro-Therapeutic Association, American Roentgen-Ray Society, Electro-Therapeutic and Roentgen-Ray Association of France.

Mr. President and Gentlemen:

The subject of tuberculosis is probably of more interest to the entire profession than any other disease at the present time, and anything that can aid us in managing this condition needs no apology for its presentation.

The ordinary treatment is tonics, diet, rest when possible, a change of climate, and anti-streptococcic serum in mixed infections for the elimination of the streptococcus.

Of all known means of combating tuberculosis, so far change of climate has been pre-eminently the most successful, as the hundreds of thousands now living on the slopes of the Rockies from Wyoming to Mexico furnish abundant proof.

We know that the main factors in their recovery and ability to throw off the disease and get well, lie in outdoor life in the warm and almost constant sunshine prevalent in this region, and the exceeding dryness of the air, which is constantly charged with fresh ozone from the mountains as the winds play back and forth across the plains.

If these natural conditions are sufficient to master the great majority of cases of tuberculosis pulmonalis, it seems to me that the rational treatment is to follow in nature's footsteps and as much as possible intensify nature's methods, which we can do by various physical means, and it is along this line I will dwell in this paper.

We find in the high altitude and dry climate of Colorado an electrical condition which it is impossible to obtain anywhere except in the driest climate—that is, the almost constant charge of high-tension electric currents to which the residents of this region are subjected.

In this dry atmosphere we have the body simulating a plate and the carpets, floor, or pavement as the disc, while the shoes

* Read before the Denver Medical Society, May 3, 1904.

form the dielectric of the ordinary electrophorus, producing a high-tension electric current when in motion, causing us to have almost constantly the frictional spark at the ends of our fingers when shaking hands or touching anything metallic. In this dry air frictional electricity is generated very readily, I might say it is synonymous with motion, and the charge is not so easily lost as it is in a less dry climate. To this electrical condition I think is due a great deal of the invigorating influence of the climate of Colorado.

This natural electrical charge can be increased by means of the static and other currents of high tension, and we know there is no better tonic than these currents when properly managed in suitable cases; nothing gives better tone to the heart and nervous system, while they seem also to have a special influence on metabolism and nutrition generally. Therefore, in using these currents we intensify one of nature's own agents and are able to get certain definite results for the good of our patients.

Another important factor to consider is sunshine—probably the most important agent in the treatment of this disease. It must go hand in hand with fresh air—rich in oxygen and ozone. The sunshine of Florida and the sunshine in Colorado is much the same. It is well-nigh universal in both regions, also the air is rich in ozone in both sections, but there is a vast difference in altitude and humidity.

It is well known that the power of the sun's rays to destroy and inhibit germ life lies in the violet and ultra-violet rays, these rays having the power of penetrating the clothing and entering the body, where they expend their energy—influencing metabolism and conserving the well-being of the individual.

In regard to tuberculosis of the skin,—lupus vulgaris,—it is not necessary for me to take up your time, as the reputation of light and the X-ray in their treatment is well established in medicine.

In deep-seated conditions as tuberculosis of the glands, bones, joints, peritoneum, and lungs, the X-rays have accomplished much, and with more experience it will be difficult to limit their field of usefulness.

In tubercular synovitis, and where the condition is one involving the ends of the bones, the X-ray is very useful, and in many cases it is the remedy *par excellence*. This subject is so

little known and understood among the profession generally that I would call special attention to the paper read at the meeting of the American Roentgen-Ray Society at Chicago by Dr. Murphy, and also to the tubercular condition of the cord producing paraplegia which were cured by the X-ray quickly and well. The healing of old fistulous tracts by means of the X-ray is also worthy of notice. Wherever located, they are favorably affected, and if tubercular so much the better. The more chronic and difficult to heal by other means the more sure is the advantage of the X-ray.

Ozone or allotropic oxygen is another valuable agent. One of the greatest benefits to be derived from a residence on the Rocky Mountain plateau is derived from inhaling the fresh, pure air which is rich in ozone fresh from the mountains and distributed by the winds over the plains.

Ozone, nature's great scavenger, can now be generated in great quantities by means of electric sparks, modified in many ways and given the patient to inhale in great quantities or *ad libitum* at the will of the patient.

My experience with the inhalation of ozone and also with the ozonized nebula has been very satisfactory, especially in cases having abundant expectoration and distressing cough; in fact, I think it a very important aid in the treatment of tuberculosis pulmonalis, and of especial value in advanced cases; in fact, I would not give it up for any other one remedy in advanced cases.

In using it, it is necessary to be very careful and not allow the patient to inhale too much at the beginning, as the effects are very unpleasant and will alarm him very much when allowed to inhale too much before becoming used to it.

At first a minute or two inhalation is sufficient, and it can gradually be increased to several minutes with great benefit to the patient. The ozone and oxygen will be found of great benefit as a tonic and stimulant, as in a few minutes of inhalation it will influence the circulation as indicated by throbbing of the temporal arteries and a full sensation in the head.

Vibration and massage are of use in almost all forms of chronic disease, for toning up the circulatory, nervous, and muscular systems, and with judicious care can be brought to the aid of the tubercular patient as well as to any other wasting disease.

In vibration we have an agent that by proper care in the selection of length of stroke, pressure and rapidity of stroke, and proper points of selection of application a great deal can be accomplished. The greatest benefit can be derived from applications along the spine over the exit of the various spinal nerves, upon which pressure is made, causing either sedation or stimulation as desired.

In pulmonary disease the method advised is to vibrate with long stroke and considerable pressure between the sixth and seventh cervical and the seventh cervical and first dorsal, with shorter stroke and less pressure from the fourth cervical to the eighth dorsal, followed by the brush for its soothing and calming effect, after which the axillary spaces are well vibrated, as are also the triangles of the neck for induction of the drainage by the stimulation of the glands of these regions.

I think there is a field of usefulness for it in many chronic conditions, and the field is being rapidly developed by many earnest workers.

Superheated dry air is of use in cases where you have an excessive toxæmia and fever in connection with cold shower baths, but it is to be used with caution, and I might say in institutional work only, as there is so much danger of taking cold on undressing and redressing after the treatment and going out into the air.

I have had a few very happy experiences with the arc-light bath, but have not used it much of late years except in sanitarium work, owing to the same trouble I have experienced with hot air, danger of taking cold.

Your patient gets hot, and even if you give a cold shower after the treatments you have difficulty in saving them from this annoyance and danger.

I think that the same thing can be accomplished with the X-ray in a much shorter time with less danger and more certainty of effect, and have therefore discarded almost all other light.

Medicinal tonics, diet, nourishment, rest, and exercise, which are of so much importance in this condition, will not be discussed in this paper, as this society is probably more familiar with this subject than any other in the country.

In 140 cases of tuberculosis pulmonalis treated by means of the X-ray without a change of climate, and reported by Drs.

Burdick, Ransome, Boggs, Rudis-Jacinsky, and Gibson there was a recovery of about 20 per cent., an improvement in about 70 per cent., with failures of about 10 per cent.

It has been my experience that my fatal cases had all progressed so far that I have been unable to control their digestion and assimilation, and as I have looked through them so often and seeing their constantly enlarged and indurated liver, I have been forced to the conclusion that the immediate cause of death in a large number of tubercular patients is due to the condition of the liver, kidneys, and stomach caused by too free use of alcoholic liquors; in fact, I have not had a single case die in which I have been enabled to control their digestion and assimilation.

These digestive disturbances can be benefited by washing out the stomach, use of the X-ray, electricity, and other therapeutic measures. Where we can succeed in toning up the digestive power of the patient to the point where we can force nutrition and thus increase the vitality and strength of the individual, a great majority have a chance of recovery, and where they can afford it a change of climate, judiciously selected, where the utmost rest of both mind and body with the highest tone to the nervous and digestive systems can be attained, wonders can be accomplished and success snatched from defeat.



Editorial.

ETHICS VERSUS COMMERCIALISM.

THE prevailing spirit of good will which has governed the actions of the honorable physician from the days of Hippocrates has been the greatest boon to poor suffering humanity.

The true physician is the man who treats his patients without reference to the remuneration that he shall receive, and the man who would arouse in the mind of the medical man the commercial spirit of the times ignores the interest of humanity and would lower the standard of the profession.

The sacred relation of the physician to the community is one which should call forth the best efforts, and demands an honesty of purpose and discriminating zeal not required in any other calling. The confidence of the patient who comes to the medical adviser in profound ignorance seeking advice in a matter of the greatest concern to him affords an opportunity for taking advantage of the patient's credulity if he so chooses. In the varied experience of the average practitioner he daily visits cases requiring knowledge and experience which cause him often to question his own capability of dealing with them in the patient's best interest. If the man is not studious and willing to thoroughly investigate every difficult case his relation to the patient places him in a position to do great injustice. The physician, under these circumstances, who is not willing to refer such a case to another in consultation or submit the case entirely to one having a wider experience than himself, assumes a commercial position.

The tendency to commercialism, however, to which we wish to refer is generally of a different character, consisting in the adoption of means of attracting public attention either by directly or indirectly advertising themselves in a public manner. That it is debasing to the professional man to exploit himself before the public can be readily understood when we

appreciate the general ignorance of the community so remarkably evidenced in the large sale of patent nostrums which are generally of questionable character.

The man who would advertise himself is not above suspicion, but from a commercial point of view may be considered enterprising. If, however, the great profession of medicine should become universally debased to the plane of commercialism, the community must suffer, because the honest man at this time, if his patronage were measured by the extent of his advertising, would have the least to do and the charlatan and blackleg would thrive.

Many difficulties beset the young physician who is not established with an income that will maintain a livelihood which will place him in such circles as make the career of a physician successful. Competition all too often is the greatest difficulty, arising from the tendency of many who are not serious to enter upon a life-work which will give them influence and position. And what is more to be deplored is the fact that the price of medical service is held altogether too cheaply by the community. The tendency on all sides is to get the best of the doctor, either paying him meagerly, or not at all, which is to be deprecated. This tendency arises from the kindly disposition of the profession to the needy. In large cities very many patients attend clinics who are well able to pay for medical service. This is done for the double purpose of obtaining the services of the best physicians, and for obtaining that service gratis; thus taking advantage of the unselfish sacrifice of the profession. The commercial methods in other pursuits and the sentiments invoked are also a temptation to those who are struggling to attain a competence. It is to be regretted that another influence is at the present time being exerted upon the minds of unsuccessful men by a very few medical journals with whom commercialism and the sale of nostrums is the dominant spirit. Such journals which seek through their editorials in a lofty spirit to influence the commercially inclined and weak men in the pro-

fession prejudice the mass of the profession, who are in spirit physicians, against their own cause.

* * *

SHALL BUSINESS COMBINATIONS CONTROL THE PRICES OF PHYSICIANS' AND SUR- GEONS' SUPPLIES?

IN the language of a member of the American Surgical Trade Association, "This is the time for unionism and combination, and it is our duty to swim with the stream, and not against it."

While it is the disposition of those who raise the prices of physicians' supplies to always contend that it is in behalf of the physicians only, in order that the quality may be superior; those who have an opportunity to look into the real motives of this combination find in it, as in all combinations of this age of "unionism and combinations," a disposition to cut out competition and place the medical man at a disadvantage. He alone is made the victim of this *trust* movement, and must carry the burden of making other people's business prosperous. The physician, who is doing more charity in the world to-day for humanity than all other charities combined, must now be made to feel the hard hand of trusts and combinations. If the medical profession permits itself to be the victim of such a combination, we believe it will be because the leading minds in the profession have ceased to think, or because the doctor is, as he is so often called, a poor business man and therefore easily victimized. Every physician and surgeon should obtain a list of the members of the American Surgical Trade Association and compel them to realize the fact that an organization disposed to prevent free competition in a free country is an enemy to the great medical profession. No better card can be used in the future, when the profession are awakened to the truth of the designs of the above-named Association, than for a business house to state that they do not belong to the American Surgical Trade Association.

Progress in Physical Therapeutics.

GYNECOLOGY AND APPLIED METALLIC ELECTROLYSIS.

BY G. BETTON MASSEY, M. D., PHILADELPHIA, PA.

The Apostoli Treatment; Final Results in Some Cases of Fibroid Tumor of the Uterus. By G. Betton Massey, Jour-Am. Med. Assoc., May 21, 1904.

The author reports, in a paper read before the Philadelphia County Medical Society, April 13, 1904, the final results of electric treatment in 110 cases of fibroid tumor, so far as they could be ascertained by personal inquiries, letters, and circulars. In some of the cases the treatment had stood the test of sixteen years since the cessation of the treatment, while in none had less than three years elapsed. The tabulated results are as follows:

Cases in which the results are unknown.....	9
Cases resulting in anatomic and symptomatic cure	22
(Including 18 that disappeared by absorption, 3 extruded through cervix in whole or part, and 1 destroyed piecemeal by electrolysis.)	
Cases resulting in symptomatic cure only.....	53
(Including 12 with great reduction in size, 26 with slight reduction in size, and 15 permanently relieved of symptoms without change in size.)	
Total cases resulting in practical success.....	75
Cases resulting in partial or complete failure ...	26
Total cases treated.....	110

Excluding the 9 cases in which the results are unknown, largely transient patients at a public clinic long since discontinued, it will be seen that the figures given show 75 actual or practical cures and 26 failures in 101 cases. In other words, three-quarters of the cases were successes and one-quarter failures.

The word "failure" should be further defined in connection with this work. With the exception of the result in one case, it means that the patient is left in a condition exactly the same as before treatment, and in a position to accept operative removal if necessary or desirable. The exception was an instance of death from septicæmia in the year 1888, due to the failure to recognize the existence of a cystic condition, an error of diagnosis which was shared with one of the most eminent of living gynecologists. How many of the remaining 25 failures were subsequently operated on is uncertain, except in the cases of seven patients, in three of which the operation was undertaken at my suggestion.

Turning from the failures to the successes, it will be noted that the result was satisfactory in three-quarters of the cases treated with known results. This is an important fact. The majority of these patients were contemplating operative removal when they sought advice, with all that it implied in danger to life and certainty of unsexing results. These women are to-day happy wives—some even disconsolate widows—for I have been surprised to note from the replies of patients who were treated ten and fifteen years ago the large proportion who have outlived the husbands that brought them to me.

The proportion of total disappearance of the tumor—18 out of 110 cases—is, I believe, larger than has been reported elsewhere. Some of these instances have not been personally verified by me, and are merely reported as the patient's opinion, but in several instances I have verified the total disappearance of growths which were originally as large as an adult head, or even larger. As for the practical aspects of the patient's opinion of the disappearance in the cases not verified, I may say that, if the person most concerned cannot find the harmless remnants of the absorptive process, who need look for them?

No one, surely, would doubt the wisdom that inspired this method when questioning these cured patients, including both those in whom a harmless remnant may be found and those anatomically cured, for it will be hard to realize that these healthful individuals were once confronted with the dreadful verdict of leaders in our profession which prescribed a dangerous and unsexing operation as the only alternative to death, or at least to permanent illness.

Turning to the question of the selection of cases for this method, these statistics teach that hemorrhagic cases are always cured of their dangerous symptoms, the hemorrhages ceasing and the tumors usually decreasing satisfactorily. The interstitial type is also peculiarly susceptible to the treatment and frequently is entirely absorbed.

Those least adapted to it are the pedunculated subperitoneal type; the hard, monocentric, ball-like inclusions in the uterine wall; and those associated with purulent accumulations in the appendages. Whether these should be removed by hysterectomy depends on the amount of suffering or deformity produced by them. The list summarized in this paper includes one case of intrauterine cystic tumor that was cured absolutely by a modification of the Apostoli treatment, but it may be stated that cystic myomata, or any other form of degenerative fibromyoma, should be removed by hysterectomy when practicable. This was impossible of safe accomplishment in the case referred to, in the opinion of the surgeons who sent her to me, and the somewhat hazardous method of treatment by intrauterine bipolar electrolytic destruction with strong cur-

rents finally resulted in complete disappearance of the growth and full restoration of health.

CONCLUSIONS.

1. A prolonged observation of cases of fibroid tumors of the uterus under the Apostoli treatment teaches that three-quarters of the cases subjected to the method will be practically cured, as attested by inquiries made from three to sixteen years after the cessation of treatment.

2. The cases that responded poorly, or not at all, to this treatment are not harmed by it, when properly applied, and heroic measures may then be adopted with the certainty that milder means are of no avail.

3. Hemorrhagic and interstitial fibroids are best adapted to the Apostoli treatment, while subperitoneal or degenerative fibroids and those complicated with pyosalpinx are least adapted to be relieved by it.

4. So far as my inquiries and circulars show, there have been but seven deaths among these 110 patients during the sixteen years or less that they have been under my observation. It is an interesting fact, moreover, that but one of these deaths was due to the progress of the growth itself, proving the non-mortal character of this affection. Of the remaining six, one died long after treatment of an affection totally unconnected with the growth, one of septicæmia under electric treatment as related, and four while being operated on with the knife.

LARYNGOLOGY, RHINOLOGY, AND OTOLOGY.

EDITED BY W. SCHEPPEGRELL, A. M., M. D.

The Radical Mastoid Operation.

The radical process of the mastoid operation generally known as Stack's is reviewed by Pooley (New York Med. Jour. and Jour. Amer. Med. Ass'n, July 25, 1903), who, from his experience, shows that the greatest conservatism should be used in the selection of this operation. Among the dangers of this procedure are the following:

The wounding of the facial nerve, dura, lateral sinus, and the semicircular canals. The facial nerve may be wounded on account of its anomalous position, carelessness in chiseling too near the floor of the external canal, or the too tight packing of the wound.

In using the middle ear curette, it must not be forgotten that the tympanic walls are often very thin from necrosis, and the internal carotid artery, as well as internal jugular vein, are imperfectly protected and liable to be penetrated.

In carrying the operative procedure upward and backward the semicircular canals must be avoided.

In contemplating this operation it must be taken into account that a radical cure is by no means always obtained by one operation. A second operation, or even a third or fourth, may be necessary, in order to obtain a complete cure of the otorrhœa.

The length of time required for the healing process may vary from three to six months. And lastly, the possibility of permanent impairment of hearing in patients who before the operation could hear fairly well.

Considering these and the uncertainty of cure, together with the long duration of after treatment, he thinks every case of chronic otorrhœa should be carefully studied before being subjected to such severe operative procedure. While he does not wish to detract from the merits of the operation, he does not think all cases of chronic otorrhœa should be indiscriminately so treated. In spite of the present opinion against the cure of otorrhœa by medication, removal of polypi, and intratympanic curetting, he holds that each of these methods often meets with success. Many cases of chronic suppuration of the middle ear can be healed by vigorous antiseptic treatment, removing granulations, cholesteatoma, etc. He summarizes his view as to when operation should be performed as follows:

The objective indications may be grouped under two forms: any case of reinfection or of a rapid extension of a chronic otitic process, or whenever a grave complication is threatened; the indication is then for immediate operation.

The indication is not immediate when the patient suffers little or no pain, and there is no striking symptom in the mastoid, but even here the indication may be operative. If the osseous lesion is extensive the subjective symptoms are: persistent and recurrent pain in the ear or mastoid process, with persistent and fixed pain in the parietal or occipital region, increased by percussion, which frequently points to temporal or cerebellar abscess; vertigo, either permanent or intermittent attacks, which may be due to erosion of the external semicircular canals, and well-marked brain symptoms, such as headache, heaviness, pressure, torpor, loss of consciousness, etc.

CURRENTS OF HIGH FREQUENCY AND HIGH POTENTIAL.

EDITED BY WALTER H. WHITE, M. D.

High-Frequency Currents. By A. D. Rockwell, A. M., M. D.
From the Medical Critic.

High-frequency currents are simply other manifestations of electric force, and just as the faradic current distinctly differs

in tension, and therefore in effect, according to the nature and construction of its coils, so high-frequency currents differ according to the nature of the electro-motive force producing them and the manner of their discharge.

The term "high-frequency" is well applied. In the production of light the vibrations are but about 36,000 per second. Hertz has shown that the vibrations of high-frequency currents reach into the hundreds of millions per second. This term high-frequency applies not only to the D'Arsonval current, but to the hyperstatic current as well, and even to the ordinary static vibratory current now in such general use. Abroad, however, when the term high-frequency is used, it applies only to the D'Arsonval current.

All high-frequency currents are obtained by a step-up process. The rapidity of the oscillations of the static wave-current are sufficiently great to entitle it to be called a current of high frequency. The hyperstatic current greatly exceeds the former in the rapidity of its oscillations, and in the same way the oscillations of frequency of the D'Arsonval current greatly exceed the hyperstatic, reaching up, as has been said, into the hundreds of millions per second. Now, the remarkable and distinguishing characteristic of currents of the highest frequency is the complete absence of motor or sensory effect. In 1890 it was demonstrated by D'Arsonval, and verified by Ward and Joubert, that beyond 5000 excitations per second the phenomena of muscular contraction became less and less, until none could be produced. A high-frequency current with its hundreds of millions of vibrations per second may be transmitted through the human body without either pain or sensation, and yet if an incandescent lamp is held between the two hands so that it receives the current, it glows instantly.

The physiologic effects produced by this painless and apparently innocuous manifestation of electric force have been made the subject of much patient investigation, and the general conclusion reached is that, over and above a distinct modification of general nutrition, there is a decided increase in arterial tension, a greater elimination of CO₂, and an increase in the production of heat. The hyperstatic current, which is simply one of less frequency of vibration than the D'Arsonval current, is in its outward manifestation very similar to the latter.

The electric spray, as it is received by the body from the electrode, has very much the same appearance in the one case as in the other. They differ widely, however, in their effect, owing to a great difference in magnitude or amperage. One will glow an incandescent lamp after passing through the human body. The other has no such power. The wire through which the D'Arsonval current passes gives off a dis-

tinct impression of heat when held loosely between the fingers. The current of lower frequency gives off no heat whatever.

This question of magnitude or amperage is one of the perplexing things connected with high-frequency currents. As to the relative therapeutic efficiency of the D'Arsonval high-frequency current and the hyperstatic high-frequency current, experience confirms what, from the nature of the two, we would naturally infer. The former, with the immeasurable rapidity of its vibrations and its considerable magnitude, influences metabolism and is indicated in general nutritional impairment. The latter has little power in this direction. Its effects are local, and its utility is especially seen in various superficial skin affections.

Appropos of these currents of high frequency, which are now exploited as entirely modern, forgotten history tells us a few things of interest. A century ago and more the physicists of that time produced high-frequency effects. In the books of the period, now long out of circulation, can be found, not only descriptions but elaborate illustrations, clearly indicating the fundamental principles of high-frequency effects through which physiological tetanus is produced. The fatal defect in the investigations of these early investigators lay in the fact that they failed to grasp the significance of their discoveries. It was left to others of later date to resurrect and practically develop their suggestions.

RADIOTHERAPY.

EDITED BY J. D. GIBSON, M. D.

Radiotherapy for Cancer and other Diseases. By Dr. W. W. McKenzie, Charlotte Medical Journal.

The writer treats on the physiological action of the rays and gives most of the different theories of action usually ascribed to them. "The theoretical advantages which the method offers" he considers as follows:

"(1) It is painless, and avoids the ordeal of operation. (2) Under proper conditions it destroys diseased tissues, but leaves healthy tissues in its place. (3) It leaves small scars. (4) It is not only painless, but has usually a very marked anodyne effect in painful malignant conditions. (5) It has a field of usefulness in cases where ordinary methods are impossible."

He calls attention to the work of Brandt in using X-ray in epileptic cases in which there were some good results, and prospects of good are held out in this class of cases.

He reports eleven cases, as follows:

1.—Male, aged sixty; epithelioma of upper lip, in which the greater portion of the lip and the floor of the nose were eaten away and the gums were also involved. After three months'

treatment the entire surface was healed and the deformity was very slight.

2.—Female, aged forty-eight; epithelioma on both left and right sides of the nose; all kinds of salves and ointments had been used without success, but by treatment of only two and a half months with the X-ray the growth entirely disappeared.

3.—Female, aged twenty-six; lupus vulgaris, long standing; involved the whole of left cheek and the left side of neck; complete recovery.

4.—Male, aged seventy; epithelioma of the left ear; one month's treatment; entirely cured. No deformity.

5.—Female, aged forty-two; epithelioma of the nose; recovery in one month.

6.—Female, negress, aged forty-eight; epithelioma of forehead; two months' treatment; recovery, small scar.

7.—Male, twenty-six; scrofuloderma; both hands and arms a mass of scales and pustules; one month's treatment; complete recovery.

8.—Female, aged forty-three; large epithelioma on back and on face; two months' treatment; recovery complete.

10.—Female, aged forty-eight; epithelioma of forehead of sixteen years' standing; this occupied almost the entire forehead from the root of the nose and including the margin of the hair. The most offensive odor. It was wonderful to see how this ugly mass disappeared. The odor disappeared after three or four exposures. In three months the whole mass had disappeared, leaving in its place healthy tissue and a small scar.

11.—Male, aged forty-nine; epithelioma of the base of the nose; the process has eaten through into the ethmoid; the case is improving and prognosis seems to be good.

Report of a Case of Carcinoma of Stomach. By Dr. P. M. Pilcher, Brooklyn Medical Journal, April, 1904.

Mrs. S., aged fifty-six, September 16, 1902, was examined by Dr. Drury, who found an induration of the abdominal wall below the liver and about the outer curvature of stomach. There was great distress on the taking of solid food. She was treated medicinally for two months, and on February 1, 1903, the tumor was found to have enlarged and become nodular, when treatment with the X-ray was advised, but was declined; ascites was then present, the quantity of fluid being great. On July 30th the abdomen was tapped, and nine quarts of amber-colored liquid withdrawn. X-ray treatment was immediately commenced by Dr. Buist at the Brooklyn hospital; three treatments of fifteen minutes each were given weekly. August 30th abdomen was again tapped, and eight quarts removed. About September 1st the patient began to improve; there was less pain and she felt stronger. She came to the Seeney Hospital September 15, 1903, and the treatments

were continued as before. The improvement was gradual but progressive. In October only three quarts were removed by tapping. The patient then complained of pain in the right thigh to the knee, which was sometimes so severe that the treatments had to be postponed. Since October the improvement has been more marked, and the patient can now take all kinds of gruels without pain and on Thanksgiving Day partook of turkey, onions, and cranberry sauce without discomfort. December 10 was re-examined by Drs. Drury, Fuhs, Fowler, and Buist, when the general condition was found to be wonderfully improved. She had gained eight pounds in weight since September 1. There was no free fluid in the abdominal cavity. Very little tympanites is present, and the patient now enjoys her meals. There are no eructations of gas, and she can walk for long distances. The abdominal tumor is markedly reduced in size, especially in the antero-posterior diameter, a little lower down than in July, and there is a freely movable nodule just above the umbilicus.

This case illustrates very well the therapeutic value of the X-ray in certain inoperable cases of carcinoma.

The diagnosis of carcinoma of the stomach could not be absolutely established, but it was clinically pronounced as such by the four above-named consulting physicians; it was considered inoperable, and the X-ray was advised as a last resort. The patient now feels well and enjoys her daily life.

RADIOGRAPHY.

EDITED BY HERMAN GRAD, M. D.

Accuracy in Diagnosis. By Russell H. Boggs, M. D., New York and Philadelphia Medical Journal, April, 1904.

"The rapid advancement of radiotherapeutic work has taken up a greater part of our time, and many details in radiography have been overlooked. In order to learn what details of technique produce the best results, a careful record should be kept, and when reports are made, more of the minute process should be emphasized. Another great mistake is that much of the X-ray work is done in a hurried manner, and some operators are never able to produce two negatives of the same standard. This certainly shows that a careful study of the apparatus and technique has not been made.

"Without having mastered the detail in the process, nothing but unsatisfactory results can be expected. The time has come for accuracy along this line of work as well as in other branches of science. Many cases in the past have been operated on unnecessarily, due to the lack of skill of some inexperienced radiographer. To-day when such a mistake occurs, it is not blamed on the fallacies of X-ray, but on the operator who

makes the diagnosis without a radiograph showing sufficient detail to give a decided opinion, or without making a careful study of the plate. It is not necessary to cite a number of cases to illustrate the above statement, as I have no doubt each of you has had cases referred after they had been operated on, in which a hasty diagnosis had been made from some poor negative. It is certainly essential that there should be a standard for a normal radiograph of every part of the body, and that unless the plate reaches this standard no diagnosis should be made.

"There are so many points which might be brought up, but I only want to mention one in regard to developing the properly exposed plate, and that is the fact that so many operators seem to develop their plates in such a manner as to obtain only surface development. It seems to have been universally adopted that the rapid and slow emulsion plates are acted upon by the X-rays in about the same manner and degree, and that the best plate is the one which has a thick coating. It should also be understood that the silver in the emulsion is affected the same through the entire thickness, according to the density between it and the focus tube, and that, as the density varies so greatly in the different parts, in order to affect the greatest amount of silver with the developer the process must necessarily be slow. Then in order to obtain a slow developer which gives sufficient contrast as well as detail and also leaves a clear negative, I have found it is necessary to use one in which the reducer is at least twice as strong as the usual formula, with about one-fifth of the amount of alkali.

"I have used many different developers, but cannot see any great advantage that one has over the other. The following gives very good results:

" Edinol	1 dram
Sodium sulphite (dry)	1 dram
Sodium carbonate (dry)	1 dram
Water	10 ounces

"With such a developer the image will appear slowly, the high lights, half-tones, and shadows appear by degrees, and as the development proceeds it is often necessary to add more alkali, but this depends upon the exposure. When developing it must be borne in mind that we have a plate which, according to the density of the part, is overexposed, normally exposed, and underexposed. These conditions are always found in X-ray work, and therefore the development is an entirely different process from ordinary photography and ordinarily cannot be successfully done by an ordinary photographer.

"The diagnosis between aneurysm and mediastinal growth in a case published in the paper, was made from the following considerations:

"First.—That the picture showed the growth was slightly

irregular, while, if it was an aneurysm, the circumference would be more regular, like the outer border of the heart as shown in a radiograph.

"Second.—That the entire mass was not of the same density.

"Third.—That there was a certain amount of fibrous deposit in the lungs.

"Fourth.—That under a fluoroscopic examination the growth did not pulsate."

THERMOTHERAPY.

EDITED BY CLARENCE EDWARD SKINNER, M. D., LL. D.

Superheated Air in Treatment of Hard Chancre. Therapie der Gegenwart, Berlin (last indexed page, 1327).

Caro has been treating the primary syphilitic manifestation with superheated air, which Hollander has been extolling since 1898. The superheated air can be applied conveniently to the primary sore wherever it is located. The specific loses its infectious character, and the treatment has a marked attenuating or abortive effect on the disease in general. When secondary manifestations appear they have always been extremely mild. They can be predicted from the behavior of the chancre under the hot air. If it persists the same size and still hard, then the infection is already systematic and secondary manifestations may be anticipated. It is surely best to treat cases on suspicion without waiting for absolute certainty, as the intervention is thus sure to be in time, and the procedure is so innocent and simple that it does no harm in any event, and requires no skill on the part of the physician.—Jour. A. M. A.

Superheated Air in Treatment of Freezing and Chilblains. Wiener klinische Rundschau, Vienna (last indexed page, 277).

Statzer relates that surprising success has crowned his application of superheated air to the treatment of frozen tissues and of chilblains. He has thus treated 16 patients. In 6 only a day or two had elapsed since the freezing, in 6 about a week, and in the others two or three months. From two to four applications were generally necessary to a maximum of ten applications of the hot-air box. The sittings were an hour each daily or half to three-quarters of an hour twice a day. The simplicity and ease of this method of treatment, its unvarying success, and the short interval before the signs of inflammation subsided and clean granulations took the place of the gangrenous ulcer, far surpassed any results obtained with other methods. The discomforts of chilblains rapidly subside. The application of the hot-air box soon after a part has been frozen will restore conditions to normal and prevent the tardy lesions sometimes observed.—Jour. A. M. A.

HYDROTHERAPY.

EDITED BY CURRAN POPE, M. D.

Hydrotherapy for the Insane. By J. H. Kellogg, Modern Medicine, January, 1904.

The writer opens his article with the statement that "there is no class of diseases in which the efficiency of the hydriatic method as a remedial agent is more markedly manifest than in the treatment of the insane, and at the present time a number of our largest insane asylums are making very extensive use of the bath in various forms. He quotes from the New York Herald as follows: "Instead of the padded cell the bath tub, instead of the strait jacket the Scotch douche. This is an institution that marks an epoch in the history of the insane. The person mentally diseased is no more to be reproached with it than the person physically afflicted. The prolonged bath is considered the most effective method of dealing with acute mania that has ever been employed. The sitz bath for cataleptics and other forms of mental disturbance and hot air cabinet have been found far more efficient than the use of drugs. In action with hydrotherapy it may be stated that the percentage of cures is very much larger than by means of the present method in vogue. In addition, fresh air and an out-of-door life is recommended. The reviewer remembers among his European experiences the interesting results of the bath treatment at Bedlam Hospital in London. This was in 1889, and it has often seemed to him that American alienists were slow in adopting methods which their foreign brethren had found to be unusually advantageous in these trying conditions.

Physiologic and Clinical Aspects of Hydrotherapy: With Its Special Reference to the Treatment of Psychoses. By R. D. Baker, M. D.

He refers to development of hydrotherapy, briefly considers its action on the skin as a sense organ, as an excretory organ, and as a heat regulator. He reports the results in twenty-six case of nervous diseases, including acute melancholia, acute melancholia with agitation, dementia præcox, hysteria, puerperal insanity. The prominent mental symptoms were depression, slowness of thought, little interest in self or surroundings, painful delusion, infusion, hypochondriasis, and insomnia. There was a lack of nervous and muscular tone, sluggish circulation, accentuated second sound, no appetite, muddy skin, intestinal fermentation, and constipation. In some cases treatment was begun with ablutions at 95°, with friction, reducing 5° daily until 65° was reached. When reaction became constant, a sheet bath at 60° was given. A wet pack at 65° was

given in some cases, followed by a general fan douche at 60° and 25 pounds' pressure for 20 seconds, friction, and open-air exercise. In those with flabby, acne-covered skins the wet pack was continued 2 to 3 hours, the colon being irritated just before with salt solution at 110°. In some cases the douche alone was used. The patients became brighter, more interested, calmer.—*Am. Med.*, 1904.

Paralysis Agitans. Some Clinical Observations Based on the Study of 219 Cases Seen at the Clinic of Professor M. Allen Starr. By J. Stuart Hart.

Hart analyzes the cases of this disorder observed in Dr. Allen Starr's clinic. He found that it occurs twice as frequently among men as women; rarely before the thirtieth year. It is not especially a disease of old age, but rather of the pre-senile period. A direct heredity could rarely be found, but there is a considerable proportion of cases with nervous heredity. He thinks we are far from solving the real ætiology of the affection, but all the factors that have been suggested have a common general weakening influence on the organism and particularly on the nervous system. The treatment consisted mainly in removing the sources of anxiety and worry, relief from exhaustive and laborious occupation, attempts to improve the general nutrition, the use of moderate exercise, the systematic use of massage and *hydrotherapy*. In a number of cases electricity was used, but with no noticeable affect. None of the drugs recommended proved regularly beneficial. Those of most value were hydrobromate of hyoscin and sulphate of duboisine. These appear to diminish the tremor and relieve the insomnia for the time. General tonics such as iron and strychnin were of value.—*Jour. A. M. A.*

PSYCHO-THERAPY.

EDITED BY LESLIE MEACHAM, M. D.

The experiments of Charpentier of Paris, in ascertaining the properties of the so-called N-rays, seem to confirm the material theories of telepathy. His last announcement is that the human body emits rays in quantities proportionate to the activity of that part of the body from which they come. He also proved that they are emitted from the speech center of the brain whenever a person speaks. The latter vary according to the pitch of the tone.

The New York and Philadelphia Medical Journal for May 21 abstracts an article on psycho-therapy in the treatment of skin diseases that is well worth repeating. The original article is by Dr. Agadzianantz in the Roussky Vrach. "In some cases

which occurred as the result of the disturbance of sensation, he has succeeded in arresting the disease by restoring this sensation to the normal. The patients who were subjected to this treatment included hysterical individuals and persons without any symptoms of hysteria. The cases selected were those in which definite causes, such as parasites, disturbances of digestion, etc., could be excluded, and no local or general treatment whatever was used, as in each instance every measure tried previously had failed. The author concludes that mental therapy is an important addition to the methods of treatment of skin diseases. Mental suggestion, acting upon the circulation and increasing the appetite, strengthens the organism, and especially the skin, and thus aids in the treatment. When the sensibility of the skin is lowered locally, various skin eruptions are often seen which run parallel to the degree of the disturbed sensibility. Mental suggestion acting upon the latter indirectly assists in the cure of the skin disease. It is important, however, to select properly the cases amenable to mental treatment, especially to exclude all possible external and reflex causes."

Suggestion in the Cure of Consumption. Eugenie R. Eliscu, New York City. Suggestion, June, 1904.

Dr. Eliscu urges that, in addition to the honored methods hygienic and dietic, it be impressed upon the patient and the public that consumption is a curable disease; that the individual and not the disease is to be treated; that the optimist will recover quicker than the pessimist; that success depends more upon the patient's own desire and will, and suggestions from within as well as from without, than upon the food, air, and exercise.

"Suggestion will not grow a new lung. What it will do is to stimulate bodily repair, by addressing the mind, be it in the psychic or waking state, to direct its invisible accelerating force to the part, organ, or tissue requiring help, and thus checking further destruction. It has this advantage over medicine: it is harmless and non-depressing. . . . The physician must not neglect the education of the patient in regard to general and thorough hygiene. . . . Suggestion and hypnotism in the hands of a skillful, conscientious operator are powerful therapeutic agents for good, not only in the treatment of functional but organic diseases. To my knowledge no other physician has ever claimed to have cured tuberculosis by means of suggestion. Yet I have used it in both tuberculosis and mental diseases with most happy results."

In the same number of Suggestion Dr. Herbert A. Parkyn contributes an editorial upon "auto-suggestion for success."

Some of the thoughts which he says should be repeated many times daily are quoted :

"I am gaining in health by thinking thoughts of health and partaking properly of life's essentials.

"I am becoming a strong man in every sense of the word. I am a strong man *now*.

"I am a fearless man.

"I am an ambitious man. I have an object in life. I desire to be a success.

"I *will* be successful in everything I undertake.

"I make friends wherever I go. Everyone likes me, and when I approach a person on a business proposition, I succeed because I know I am right, and my strength, determination, aggressiveness, and earnestness win the day for me.

"*I am a success.*"

[Many others of similar tone are given. These are probably the soul-food upon which Parkyn fed while mustering up the necessary nerve to put an embryo Mexican sugar plantation into the hands of his trusting subscribers.—L. M.]

BOOK REVIEWS.

RÖNTGEN RAY DIAGNOSIS AND THERAPY. By CARL BECK, M. D., Professor of Surgery in the New York Post-Graduate School and Hospital ; Visiting Surgeon to St. Mark's Hospital and the German Poliklinik. Published by D. Appleton & Company, New York and London. Price \$4.00 net.

The name of this well-known author, who has devoted so much attention, and done such good work in the use of the X-ray, causes the reader to expect a valuable production from his hands, and in this he will not be disappointed. He has, in his endeavor to make the work practical, emphasizing the essential points, not only succeeded, but he has done more. He has contributed a work conservative in character, but thoroughly scientific and calculated to place the uses of the Roentgen ray on a practical basis.

In Section I the author considers the technical employment of the X-ray treating of General Technique, Fluoroscopy, Skiagraphy, and the Examination of the Patient.

Section II, is devoted to the Regionary and Clinical part of the work, with chapters devoted to the Head, Neck, Chest, Abdomen, Pelvis, Lower extremity, Malformation, Diseases of the Bones and Joints, Neoplasms, The Utilization of the Roentgen Rays in Fractures, The Operative Treatment of Deformed Fractures as Indicated by the Roentgen Rays and the Medico-legal Aspect of the Roentgen Rays.

Section III, considers The Effects of the Roentgen Ray in which chapters are devoted to Roentgen Therapy, Special In-

dications, Becquerel Rays and Radium, and Finsen Method and Ultra-violet Rays.

The work covers 460 pages and contains 322 illustrations, most of which are from half tones, well executed. We believe, in no work to the present time has there been shown an equal number of exceptionally good skiagraphs, upon which the author is to be congratulated.

The work is an example of the book-makers' art and deserving of the highest commendation.

A NON-SURGICAL TREATISE ON DISEASES OF THE PROSTATE GLAND AND ADNEXA. By GEORGE WHITFIELD OVERALL, A. B., M. D., formerly professor of physiology in the Memphis Hospital Medical College. Published by Marsh & Grant Company, Chicago. Price, \$1.50 net.

The author shows clearly how by careful diagnosis and the application of electrolysis, cataphoresis, faradization, etc., at the seat of the disease, the most obstinate of these conditions may be overcome.

He is to be complimented on his technique, and his reported results are nothing less than brilliant.

With such possibilities before him, the surgeon may well think twice before sending his patient through the horrors of a Bottini, modified or otherwise, much less that of extirpation or enucleation.

B. M.

HIGH-FREQUENCY CURRENTS AND FINSEN LIGHT THERAPY. By JOHN MCINTOSH. Published by the author, 95 Dearborn St., Chicago, Ill. Second edition, price \$1 net.

This little book, written by a layman, contains numerous abstracts from the different authorities upon the use of high-frequency currents and suggests a range of application for high-frequency administration, but gives comparatively little pertaining to the technique of methods of administrations. Considerable space is given to the consideration of apparatus, especially the apparatus employed in connection with coils. The last part of the volume is devoted to the discussion of the treatment of diseases by light, following the method of Finsen and describing the various apparatus employed. Considerable space is devoted to Finsen's report of cases and results of treatment.

ANNUAL REPORT OF THE SURGEON-GENERAL OF THE PUBLIC HEALTH AND MARINE HOSPITAL SERVICE OF THE UNITED STATES FOR THE FISCAL YEAR 1903. Washington Government Printing Offices, 1904.

This valuable report contains the Secretary's Letter to the Congress; Summary of Operations; Division of Personnel and Accounts; Report of Division of Marine Hospitals and Relief; Division of Sanitary Reports and Statistics; Division of Foreign and Insular Quarantine; Division of Domestic Quarantine; Division of Scientific Research; and Miscellaneous Division, including contributed articles and necropsy reports.

The reports are full and a very valuable summary of the department work.

THE MAN WHO PLEASES AND THE WOMAN WHO CHARMS. By JOHN A. CONE. Price 75 cents, postpaid. Third edition. Published by Hinds & Noble, New York.

This little book is another of the valuable series which these publishers are placing before the youth, which are doing untold good. The book is written in excellent style and contains gems from the best moral teachers. It has been the author's intention to place familiar facts in a new dress for the study of those who are building character, and to teach those niceties of speech and manner which make the girl blooming into womanhood, agreeable, attractive, and lovable, and in this he has succeeded. The young woman who has the good fortune to possess this little volume will find it a valuable guide.

ERRATUM. Radiotherapy. By Dr. Leopold Freund. English Translation by G. H. Lancashire. Publishers, Rebman Co., 10 West 23rd St., New York City. The price should have been \$5 instead of \$4 net.

NEW AND IMPROVED APPARATUS.]

This department is devoted to publishing, with illustrations, drawings, and descriptions, new apparatus, electrodes, etc., for the benefit of those interested in the progressive improvements in armamentaria.

SOMETHING NEW IN X-RAY TUBES.

We herewith show in the accompanying illustrations a new form of vacuum-regulating tube, and a tube specially designed for heavy coil work, which have just been perfected by Green & Bauer, the well-known tube manufacturers of Hartford, Conn.

The new method of vacuum regulation consists of a projecting portion of the tube having a capillary opening at its end, sealed by means of a cushion which is held in place by a screw cap; the operation consists of unscrewing the cap, which opens or uncovers the capillary opening, and allows a direct feed of air from the outer atmosphere.

It is now a well-known fact that an X-ray tube, in order to give the best results, must be exhausted to just the right vacuum, and must be so constructed that it will not become low or soft in use, neither must it become high or hard beyond certain limits. In order to more fully and intelligently explain, we will follow the tube in the process of exhaustion.

When the tube is just ready for attachment to the vacuum pump, it is full of air, and the metals which form the electrodes are impregnated with certain gaseous matter. As the air is pumped out a tendency to a vacuum is created therein. Al-

though the air is taken out to such an extent that the current will hardly pass through the tube, still it is by no means ready to take off the pump, for as soon as an excess of current is forced through it the gases of the metals are released, and the tube shows only a violet color. These gases will continue to be driven off from the metal until they are exhausted from the metals of the tube. The same effect may be produced by burning up the gases; this is only accomplished, however, by long running of the tube on the machine with very little use to the operator. This process is called "curing" a tube, but with the present up-to-date processes the annoyance attendant on curing tubes is not necessary, for only tubes which have been improperly made in the first place require curing.

Heretofore every operator with X-ray tubes has found that just when a tube begins to do the best work the vacuum suddenly becomes too high, the current refusing to go through

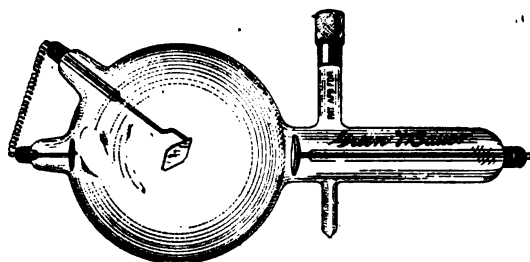


Fig. 1.

it, or only after requiring a long and tedious coaxing. This is caused by the destruction of the small amount of air which is necessary to permit the passage of the current. Ordinarily the tube is then ready for the repair shop. With the form of regulator shown here the doctor becomes his own tube repairer, unless the tube becomes punctured, and that with no trouble. By unscrewing the metal cap and immediately screwing it up again, an air passage is opened and a small amount of air is added and the tube is again as good as new. This may be done an indefinite number of times, and the quality of the tube as often restored.

Another important feature of the tubes made by this firm is that very thick pure platinum targets are used, allowing no possibility of burning the target through. The only additional charge made is for the platinum, which will be returned for the old target in exchange for another tube. Pure platinum gives so much better results than the nickle-plated targets so commonly used in foreign tubes, that there is simply no comparison. Such tubes must be used to be appreciated. The tube shown in Fig. 1 is designed for use with static ma-

chines, and is designated as Static Tube No. 40B. It should further be understood that it claimed by the manufacturers that for radiography this tube has no equal in bringing out the detail of the soft tissues, muscles, etc., for the reason which must appeal to all operators that a tube that can be kept low always has the proper qualities for giving the best detail on the negative. A tube can only be maintained at a low vacuum by replenishing the air supply. This is accomplished by their tube and at less cost for the tube in the first place than any other. No sparking, no trouble, steady fluoroscence, and the maximum number of rays.

With tubes for heavy coil use, a good deal of annoyance has been experienced by operators, especially with coils giving from 12-inch to 30-inch spark when tubes are used which are

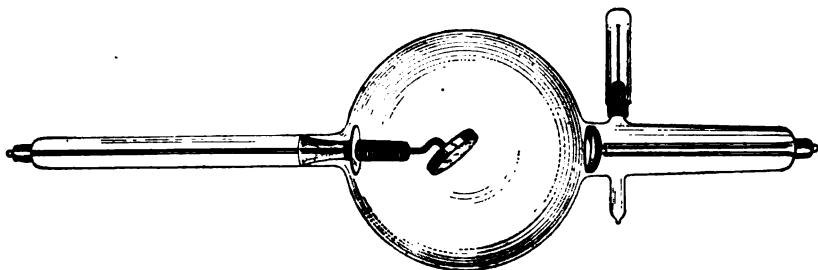


Fig. 2.

not built heavy enough to take the full amount of current, and not back down in vacuum until they are quite or nearly uselessly low. The Compound Tube No. 26 (see Fig. 2) will take all the current you can give it in connection with an electrolytic interrupter, and will not lower in vacuum, and will make a radiograph of any part of the body of a heavy man in one minute or less. It may be allowed to take the current for one and one-half minutes at a time without danger. This tube can also be readily regulated in vacuum, and is practically indestructible. Both of these tubes are the particular invention of Green & Bauer, and they now have patents pending on them. They are the results of nearly nine years' experience, during which time they have held the record for making superior tubes. They were the first in the United States of America to make a tube for X-ray work, as also to make a radiograph.

All types of tubes are made at their factory, including the latest and best type of water-cooled target tubes. They are indebted to one of their competitors for this type, however, and only claim to have perfected it.

They will be glad to receive inquiries from their many friends and the profession generally regarding their troubles with tubes, and will mail illustrations of tubes to all who write them.

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ELECTRICITY IN THE TREATMENT OF DISEASE.*

BY CHAS. HENRY SHEPARD, M. D., BROOKLYN.

It is a well-conceded fact that electricity is a powerful factor in the treatment of disease while, like other agents, its value largely consists in its proper application. True, inexperienced operators sometimes bring about surprising results, but as the laws governing this mode of treatment are inflexible and invariable, as well as persistent, the more these laws are understood and obeyed, the more uniform and positive are the results attained.

Acting upon the theory that electricity is a vitalizer of the highest order, and has the power of quickening the action of the nervous system in any part of the body, we have made successful use of the faradic current in association with the Turkish bath.

Over twenty years' experience with the electro-thermal bath has demonstrated its efficiency in a variety of cases, largely those of the neurasthenic class, as well as in rheumatism and malaria. While it has been greatly to the advantage of the patient that as a rule the hot air, or Turkish bath, was first administered, the use of electricity in this form has greatly assisted in restoring normal action, for, as we understand disease, it is a restorative action, nature invariably endeavoring to bring about normal conditions, which means health.

Inasmuch as the blood is the agent that supplies life to every cell in the body, the health of the individual cell depends upon the integrity of this supply, and disease is easily traced to some imperfection of this supply. When this is normal we have a normal condition of the body, and the reverse is equally true.

It is freely conceded that the initiative of most of the diseased conditions we have to deal with is due to an overworked and

* Read before the thirteenth annual meeting of the American Electro-Therapeutic Association, held at Atlantic City, September 22, 23, and 24, 1903.

overloaded nutritive system; that if people generally would eat less there would be less of disease to disturb the community. But as there is little hope of reforming the people of this fast age, our only opportunity is afforded when they are in a penitential mood, due to the punishment they are receiving from the effect of past transgressions. Admonitions will then be heeded, and a more reasonable course entered upon, at least for a time.

Nature's method of dealing with diseased conditions is by forcing out the disturbing elements through the natural excretory organs—the bowels, the kidneys, the lungs, and the skin—but when there comes a sluggish action from overwork or other causes, more or less residue is left in the system to still further aggravate an abnormal condition which we call disease. Here is where electricity is found useful in quickening dormant function, through the nervous system. If this blood supply can be purified and invigorated, the fountain head of the disturbance is reached, whatever may be the name or nature of the trouble.

The use of hot air is another powerful factor in the treatment of disease. By its action we have a wonderful control of the circulation and command over disease. Heat tends to destroy the virus of all non-vital matter with which it may come in contact, and also invites the blood to the surface; there it uploads its impurities, sending back a cleansed and invigorated current, that not only builds up with new and better material, but the improved circulation quickens every function, thus securing, through elimination, the condition which leads directly to perfect health. This fact is fully demonstrated by the record of thousands who have been relieved through this means alone.

In cases of catarrh, hay-fever, grip, or ordinary colds, which may be considered simply a condition of repletion, we find the blood and nervous energy directed to the mucous surfaces, but by the action of electricity and heat we bring about a derivative action, and then, by stimulating elimination through the skin especially, as well as the other secreting organs, normal action is quickly restored.

With almost universal success in treating that class of cases on this hypothesis, we have not hesitated to advise the sufferers that, if they would avoid the repetition of such conditions,

it would be wise for them to take more heed to the quality and quantity of supplies furnished in their daily rations. With full development and advancing years there is naturally less exercise indulged in, and less food is needed to meet the body's requirements. There is also less ability to dispose of the amount which is ordinarily partaken.

A few cases may be mentioned to show some of the results that have been secured.

A lady who had been under the care of many physicians, both in this country and in Europe, was given an electrothermal bath, and the diagnosis from that revealed a congested condition of the transverse colon, heretofore unsuspected, which a few subsequent treatments entirely relieved, and her life was made comfortable thereafter.

A young man from the country had yielded to the temptations of city life, until paralysis unfitted him to even feed himself. Three months of daily application of the faradic current, in conjunction with the hot air treatment, enabled him to go up and down stairs so fast that one would hardly think he had ever been disabled.

A young man who was so crippled with acute rheumatism that he could not walk was given two treatments daily. In the space of one week he was so much improved that he could go up and down stairs without help, and in three weeks he left for home, able to attend to his ordinary business.

A severe case of chronic rheumatism was brought for treatment by his physician. The patient was anæmic, weighing but 100 pounds. All movement was painful, with enlargement of knees and ankle joints. Three months of two treatments daily restored his health, and at the same time he gained seventeen pounds in weight.

A case of sciatica that had resisted the ordinary treatment of two months' duration, was entirely relieved in a few weeks by a combination of the hot-air bath and electricity.

An overworked physician, aged fifty-two, with rheumatism affecting both the joints and the sciatic nerves, after a two-weeks' course of daily treatment was enabled to resume and continue his work.

Such instances are sufficient to prove, beyond need of argument, the efficacy of electricity in the treatment of disease.

Discussion.

Dr. W. J. Herdman said he was very glad to hear this testimony from Dr. Shepard, because he knew of no one else who was so well qualified to speak of this particular therapeutic combination. Not all hydro-therapeutists went so far as to add a very essential element to that work. We all knew there was in hydrotherapy a debilitating action. Elimination it certainly accomplished most efficiently, but in persons especially who had long been in need of elimination, such treatment left them in a flabby, prostrated and debilitated state; not that this was necessarily the result of hydrotherapy *per se*. The author made use of the induction-coil current, a current which all present knew stimulated muscular action and quickened protoplasmic activity. Such activity depended very largely upon the contraction of unstriated muscular tissue; hence, the rationale of this excellent treatment. The patient's metabolism was quickened and the muscular system stimulated at the very time when the eliminative part of the treatment was carried out by means of hydrotherapy. If other hydro-therapeutists would appreciate the value of this combination, he felt sure that many more would flock to these establishments than do at present.



THE RADIANT-LIGHT BATH IN THE TREATMENT OF NEUROSES.*

BY T. D. CROTHERS, M. D., HARTFORD, CONN.,

Superintendent Walnut Lodge Hospital, etc., etc.

In a paper before this association last year on some clinical indications for the use of the radiant-light bath, it was contended that this therapeutic use of electricity was of wider application and superior to many other forms of this agent. Another year's experience, based on the studies of nearly a thousand baths given under my direction, has fully sustained my previous convictions of the value of this therapeutic agent, and indicated some possibilities which a larger experience promises to sustain. The apparatus described in my last paper is simply a small room covered with incandescent lights in which the reflecting power is intensified as far as possible by a lining of tin. All the baths given were followed by showers, douches, and rubbing. These means increased the effect from the action of the light, and are to be considered in a study of its power. A hot-air or Turkish bath was in operation in an adjacent room during a large part of the year; and patients who used the light bath were allowed their choice of the two, for the purpose of practically detecting any difference which might be recognized. In some instances patients used the hot-air bath one day and the radiant-light the other. In all cases decided preferences were manifest for the electric-light bath; the reason given was greater exhilaration during the bath and more quietness and rest after. In measurements of the pulse, temperature, and tonicity of the arteries, the radiant-light bath showed great superiority. The effect on the temperature varied but little, in some instances either rising or falling after the first bath, later remaining about the same. The changes in the pulse rate were more marked in the hot-air than in the radiant-light bath, usually rising in the former and falling in the latter. The tension of the arteries invariably fell from the action of the light bath, but did not always change with the hot-air bath, unless the time of using it was prolonged.

* Read at Annual Meeting of the American Electro-Therapeutic Society at Atlantic City, September 22, 1903.

No study was made to discriminate between the action of the light or hot-air bath, until after the use of showers, douches, and massage and the patient had become quiet and rested. All the persons treated were neurotics, suffering from various forms of psychoses and toxæmias. A marked symptom was noticed in nearly all cases after the bath, of exhilaration with a soothing impression following; while from the hot-air bath many persons complained of exhaustion, with headache which was usually transient. The physiological action of the radiant-light bath depends on the heat and chemical rays coming in contact with substances that are resistant to their passage and thus become transformed into heat and chemical energy. The skin is a poor conductor of heat, but transmits light and radiant energy readily. This in the deeper tissues becomes changed into heat. In the hot-air bath the heat is slowly carried in by conduction and its effects fall most heavily on the surface. Radiant heat penetrates the tissues more quickly than conductive heat, increasing the sedative activity by its direct influence, while conducted heat is only directly a sedative. The chemical rays from light stimulate the nervous system and cell energy in both animal and vegetable life. The radiant-light bath has two marked actions on the skin and tissues—one of stimulation, and the other a sedative effect. The stimulating action falls first on the sensory centers, then on the vaso-motor centers and heat centers, lastly on the secreting centers. The sensory centers are always affected by the action of heat, light, and cold on the skin. The vaso-motor centers, controlling the constriction and dilatation of the walls of the arteries, respond very quickly to surface changes. Light seems to have a special action on the vaso-dilators of the arteries, stimulating increased activity and permitting the blood to flow more rapidly to the surface. This takes off the burden of the heart's action and relieves the constrictions to the arterial circulation and to the capillaries. The increase in volume and uniformity of the flow of blood, with lowered tension, makes this evident. The sensory centers show a marked change and diminution of nerve irritation and debility. The secretory centers are profoundly affected and the elimination of fluids is rapid and intense. Oxidation is increased with the increase of elimination. These various sensory centers are often differently affected. The sensory centers in some instances act slowly, and only after

the bath has been given many times are they affected; also the heat centers are slow to respond to the light, but later they act quickly. In toxæmias the secretory centers are profoundly stimulated by the light bath, while in neurotics this stimulation may not be noticed for some time. Where marked fibrinous deposits are apparent in the arteries and liver, both secretory and heat centers seem to be very active. The fall of the arterial tension and the uniformity of the pulse and respiration following the action of the light are marked symptoms. The following are some clinical illustrations of the action of the baths:

Example 1.—An active business man in middle life suffered from fainting and dizzy sensations following excitement and overexertion. The heart was hypertrophied and the arterial tension was high, indicating a fibrinous condition of the arteries. He was given electric-light baths daily, with hot showers and douches and the static breeze. This treatment was followed by marked recovery.

Example 2.—A moderate drinking business man whose life has been one of great mental strain and worry came under my care for asthmatic symptoms associated with sudden depressive heart action. It was called cerebral exhaustion. A course of Turkish baths had failed to bring relief, and he complained of dizziness, with fluttering heart sensations, for which various forms of alcohol were given. The alcohol was withdrawn and the patient put on an active saline treatment, with the radiant-light bath followed by showers and douches and constant rest in a reclining position. The bath produced intense prolonged sudorific action with a high surface temperature. In some instances this temperature went up three or four degrees, but quickly dropped from the action of showers and douches. The pulse rate declined with each bath and the fluttering heart symptoms disappeared. The heat centers seemed to be very greatly disturbed, and in the morning he complained of chills and cold and was taken to the light bath, remaining a few moments and taken out before perspiration began. The regular bath was given in the evening, after which he slept quietly. There was evidently toxæmia in this case, noted in the strong acid odors from the perspiration during the first week of treatment. A static breeze was given every day in connection with the bath. He made a good recovery.

Example 3.—A lawyer thirty-five years of age had used spirits for insomnia and overwork for many years. He had been under the care of many physicians and taken electrical treatment with a variety of drugs, but had gradually grown worse. Spirits and drugs were taken alternately for years. After some preliminary treatment by salines and the withdrawal of spirits he began the use of the radiant-light bath. The perspiration was not very intense at first, but the action of the heart was increased. The temperature dropped from one to two degrees. On each succeeding bath the pulse rate was raised from ten to fifteen beats and the temperature lowered. At the end of a week all drugs were dropped and the bath was given daily. The rest after the bath was very refreshing, and increased in duration until finally he could sleep about eight to nine hours. The insomnia passed away and the restoration was rapid and complete.

Example 4.—A physician of fifty years of age who was severely shocked from an electrical current passing through his office where he was reclining five years before. From this time on he had drunk spirits steadily to quiet his nervous system and to promote rest at night. He had an intense fear and dread of electricity in all forms, and had strong delusions that he would be injured by an electrical current in some unknown way. For some time after coming to our hospital he refused to take radiant-light baths, using the hot-air bath and receiving the shower and massage afterwards. Perspiration was slow, and but little change in the temperature followed these baths.

He finally consented to take a radiant-light bath, remaining in only three or four minutes at first—just long enough to cause slight perspiration. It was found that his skin was hypersensitive to the action of light, and intense perspiration broke out in four or five minutes after admission with a high surface temperature. The shower afterwards reduced his temperature. The heart's action was raised, but fell quickly from the action of showers to normal. A marked sedative effect followed these baths, with the disappearance of the electrical delusion and a rapid improvement mentally. A persistent dyspepsia which had followed him for many years disappeared, and he recovered and is now at work again in his profession.

Example 5.—A medical man, neurotic and gormand, who

had been alternately a drug taker and spirit user for many years, then for a time abandoning them all and living for months strictly abstinent. He was credulous and had great confidence in drugs, and used freely many prescriptions both proprietary and other combinations. He had taken electrical treatment and had been an intimate of two sanitariums without receiving much benefit. On admission he was using paraldehyde four times a day, and was considered a chronic inebriate. All drugs were withdrawn and he was given the electrical bath twice a day, remaining in the cabinet until perspiration was very profuse, then taken out and showered and put to bed. The temperature was invariably lowered, the pulse was raised by the bath, and the tonicity of the arteries greatly diminished. Later the first morning bath was confined to two or three minutes, while the evening bath continued ten or twelve minutes. The surface temperature of the body was 105° and 106° after leaving the cabinet, but rapidly went down to normal after the showers. The tonicity of the arteries diminished, and both the bowels and kidneys acted quite freely after the evening bath. Later the static breeze was given before the bath and sometimes after. The nervousness disappeared and nutrition improved, and restoration followed.

These cases may be duplicated covering many pages; they would all show some general conditions for which radiant-light bath seems to have a marked action. There are two forms of neuroses which appear to be especially benefited by this form of bath. One are the toxæmias, and the other the palsies. In the first class may be included the various influenzas and digestive troubles noted by irritation, depression, headache, irregular heart's action, and other forms of obscure neuroses. The action of the radiant-light followed by hot- and cold-water applications seemed particularly valuable in these cases. The excessive sudorific action draining the water and the salts from the blood and carrying with it the waste products is often followed by a profound sedative influence which resembles that from opium. Dr. Kellogg believes that the light changed to heat in the deeper tissues increases the perspiratory action and excessive drainage of the toxæmes of the system. Dr. Rockwell describes the sedative action following the perspiration to the sudden and intense drainage of the inflammatory products of the system through the skin to the surface. Very marked

effects have been noted in the diminution of albumen in nephritis, and also of the relief of the symptoms of prostration. In one case under my care urea and sugar disappeared from the urine after a few baths. In all cases a great improvement took place in the heart's action, as proven by the sphygmographic tracing taken before and after the bath. Several persons in whom symptoms of organic changes of the heart were prominent have been greatly relieved by the use of the baths. Dr. Howell noticed after the radiant-light bath a peculiar heart murmur not recognized before. In pleuritic effusion which had existed for some time great improvement followed the use of the light bath with the shower after. In the second form of neuroses, which I have termed general palsies, the baths seem to have an equally good effect. Many of these nerve disturbances may be described by the term *neuresthenias cerebrothenias*, and the multiple palsies and defects of motor and sensory centers where nerve vigor, force, and energy are disturbed and depressed below the normal, also in many of the disturbances following deranged cerebral circulation with defective nutrition. Dr. Kellogg has fully recognized this condition and believes that radiant light penetrating deep into the tissues changes into heat and has a special power to promote and give new energy to dormant cell activity. The results obtained in some instances seemed very clearly explained by this theory. Evidently the increased oxidizations of the blood and the disappearance of the toxic agents by drainage through the skin promote this and are prominent factors in relieving the exhaustive and defective energies. Many of the persons coming under my care are distinctly those of palsies, the causes of which vary widely. The radiant-light bath, with massage and static breeze later, has proven a most powerful therapeutic agent, while its effects vary in different persons, probably owing to unknown causes; although the symptomology is much the same, the results have been uniform and more satisfactory than from any other remedial agents I have used. In one instance the sudorific action was very slight until douches and massage had been given, then perspiration broke out in great profuseness. This peculiar condition was followed by prolonged and refreshing sleep; apparently the heat and nerve energy had accumulated and only broke out from the action of some peculiar causes. The temperature

and pulse did not change much. In the second anomalous case perspiration was very slight, and although the patient remained in the bath for fifteen minutes there was no change except a rapid rise in surface temperature. In this case the kidneys acted with great intensity for an hour after. In a few instances the point of elimination was highest in six or seven minutes after admission to the bath and then began to decline. In one instance the effect of the bath causing profuse perspiration, stopped in a few moments, and reappeared three or four times during the next twenty-four hours between the baths. This was checked by showers and eventually passed away. Extreme perspiration in different parts of the body was frequent, but usually changed after a few baths. In all cases the nutrition and appetite improved after the baths were used for several days. The vaso-motor facial palsies so common among spirit drinkers were greatly lessened and in some instances practically cured. In several instances external perspiration was confined to the surface of the head and face, and in others it appeared most profusely in the extremities. In these cases prolonged showers and massage were given after and before the bath, according to the circumstances. Mechanical massage and muscular vibration were also given in these anomalous cases, and head breezes from the static machine, with good results. Before the bath the patient drank frequently large quantities of salines and carbonated waters, and in certain drug takers saline waters were given for their cathartic and diuretic action before the bath was used. Experience seemed to encourage these and similar means for the purpose of increasing the tonic effect of the radiant-light bath. In addition, the power of suggestion was made a prominent factor in treatment, and efforts were used to increase the confidence of the patient in the value of this means by asserting what its effects would be and building up expectations as far as possible to sustain such assertions. Whenever a patient manifested credulity concerning the effects of the bath, all measures were used, such as the static breeze, salines before and after, with different douches and massage to keep this credulity up to a certain point. The conclusion was unmistakable that the electric radiant-light bath given in connection with these other means mentioned is practically one of the most powerful therapeutic agents which can be used.

There are many reasons for believing that the various currents and X-rays now used for such a great variety of diseased conditions could be immensely improved by the addition of this form of bath. In all forms of neurotic disease it has clearly a specific value in connection with other methods and means along this line. A physician who had a patient in his family suffering from lupus has arranged an electric-light bath, and is using it daily in connection with the X-rays and other methods. In his opinion the action of the X-ray with this bath is intensified and the vigor of the body is increased with the most promising effects.

From my limited experience with the effects of the bath on general conditions of debility and disease I am fully sustained in urging that in all cases where electricity is used it be supplemented by the radiant-light bath with showers and massage. It is quite certain that the palsies would be immensely benefited by measures of this kind in conjunction with the various electric currents when given at stated intervals. One of my patients, who had a very thorough electrical treatment from an eminent specialist, relapsed and came under my care for painful insomnia for which he used many narcotic drugs. The electric-light bath, given with douches before and after, completely changed his condition, and he is now practically restored and is using the bath every week with great satisfaction. This bath is not urged as a new and specific remedy, but only as an adjunct and most practical form of electric energy for therapeutics when used in conjunction with other measures. Some of the conclusions which I wish to make prominent may be summarized as follows:

(1) The radiant light penetrating to the deeper tissues of the body is turned into heat or transformed into nerve energy more positively than that of heat from hot air.

(2) The clinical effects of the bath prove its power as the eliminating agent and a corrector of neurotic, nutrient, and capillary disturbance.

(3) In neurotic diseases its action in conjunction with other measures is far superior to any of these means when used alone.

(4) The evidence so far points unmistakably to the possibilities that, when used in connection with other electro-thera-

peutic measures, it may come into general use and constitute a real advance in the progress of neurological therapeutics.

Discussion.

Dr. M. A. Cleaves said that ten years ago Dr. Herdman, the then president, in establishing a committee for research into the action of light as a therapeutic measure, had named her as one of the committee. Since that time she had taken much interest in this subject, but her experience had been chiefly with the arc light. She was of the opinion, however, that the incandescent-light bath was better for the class of cases chiefly considered in this paper. Her experience had been chiefly with the arc light, and she had used it in tuberculosis, asthma, bronchitis, convalescence from broncho-pneumonia and grippe, anæmia, and other conditions. The treatment has been conducted with the light-baths alone and in conjunction with other therapeutic measures. She had also used the entire energy of the arc in local skin affections, as well as latterly the ultra-violet ray, both with a Finsen tube and similar devices. She had not the slightest doubt that with the incandescent- and with the arc-light bath better work could be done than with electrical treatment alone. There was, in her opinion, no better eliminating agent than a radiant-energy bath.

Dr. Crothers said that we were called upon very largely to treat toxæmias, and that, therefore, this thought should be kept prominently before us. This being the case, he thought it was evident that radiant-light baths should prove useful in a great many conditions.



PROBLEMS IN ELECTRO-THERAPEUTIC
PRACTICE.*

Dr. C. R. Dickson asked regarding the probability of producing an artificial menopause when raying the abdomen for uterine fibroid. The question had been raised by a patient.

Dr. Snow said that a cessation of menstruation was likely to occur, but, in his opinion, it was temporary. If the process of raying were stopped early enough, *i. e.*, before fatty degeneration in the arterioles had occurred, he thought the cessation of this function would be only temporary. The contraction which took place in a fibroid he believed resulted from cell contraction and cutting off of nutrition, and it was probable that the same thing took place in the ovaries.

Dr. Willis P. Spring asked regarding the effect of the use of the fluoroscope on the sight of the operator.

Dr. W. J. Herdman said that very definite information could be obtained upon this point from Mr. Rollins of Boston, a very close investigator of the X-ray and a very careful physicist. This gentleman had made the statement that there was uniform deterioration of the sight from the use of the X-ray.

Dr. C. R. Dickson remarked that one of the absent members had had his sight almost ruined in this way.

Dr. A. W. Baer said he understood that in India, when it was desired to destroy the usefulness of a criminal, they threw a very bright light into his eyes, thus destroying his sight without making it noticeable to others.

Dr. C. O. Files asked what means could be taken when using the X-ray constantly in order to protect the eyes. Were the glasses prepared for this purpose sufficient?

Dr. Loring of Boston said that one very simple means of protection that he had adopted was to put a piece of thick glass between the observer and the fluoroscopic screen. It protected the eyes without obscuring the view. At first his own eyes had become affected, but after adopting this method of protection his eyes had improved.

Dr. Spring said that he made use of the protection afforded by glass.

Dr. A. C. Bayliss said that one should keep out of the field

* A discussion at Atlantic City at the meeting of the American Electro-Therapeutic Association, September 23, 1903.

of the X-rays. The use of the fluoroscopic screen was unreliable except in a few cases, such as the examination of the thorax, and hence it was well to avoid the use of the screen.

Dr. W. B. Snow said that the statement made by Dr. Loring seemed to him exceedingly valuable, glass containing lead being especially opaque to the X-ray although transparent to ordinary light. This should prove a practical solution of the difficulty, and seemed to be confirmed by the fact that Dr. Loring had made use of this means of protection in his own case.

Dr. Goodell asked Dr. Loring if a person who did not use spectacles could have spectacles made of ordinary heavy glass for this purpose.

Dr. Loring replied that the glasses should be made much thicker than those employed in spectacles, and that the glass should be applied to the back of the fluoroscopic screen.

Dr. Snow remarked that this plan was particularly useful because it kept the fluoroscope clean.

Dr. R. J. Nunn said that Dr. Corson had used the X-ray a great deal and had ultimately procured glass for protection. In all cases the glass should be tested by means of some fluorescent substance or by means of a sensitive plate. This would exclude the use of rock crystal and certain qualities of glass which are more or less permeable to the X-ray.

ZINC-MERCURIC CATAPHORESIS OF TUBERCULAR GLANDS.

Dr. G. B. Massey gave a practical demonstration of this method. A sliver of zinc, sharpened at one end, is used for the active electrode. If the gland to be treated were unopened the sliver of zinc should be uninsulated at first, and should be dipped in mercury just before use. The point of introduction is chilled with ethyl-chloride spray, and the puncture is made with a Hagedorn needle. Immediately afterward the zinc electrode should be inserted, and then a current of from one-half to three milliamperes turned on for half an hour. A drop of a saturated solution of cocaine is dropped in alongside of the electrode. A cylinder of necrosed tissue comes away within a few days, and the treatment is repeated through this opening, using an insulated zinc electrode. The gland becomes so impregnated with mercury that it drains downward and favorably affects other glands in the chain. The active agency

in the treatment is the chloride of mercury and zinc. In addition to this there is marked general improvement in these patients, although no other method of treatment is employed at the time. He had used the method in six patients. A little girl was shown who had been treated for about three months, three times a week; also a young lady patient.

Discussion.

Dr. Reyburn said that he noticed in one of the patients exhibited quite large scars that had been produced by the knife before the patient came under Dr. Massey's observation, and this led him to speak about the objection to the knife in such cases. He objected to the use of the knife because when a tumor of any kind was taken out by the knife, every vein and lymphatic channel was laid open for absorption. This explained the very discouraging results obtained even in operations so extensive as to almost warrant one in saying that the patient had been removed from the tumor. In most cases the limits of the neoplasm were far beyond their apparent limits.

Dr. M. A. Cleaves said that about the year 1898 she had treated a case of tubercular adenitis by the same method, only using a copper electrode instead of a zinc one. The gland had previously suppurated, and was open. The wound was reopened and the copper electrode introduced. The result was as satisfactory as in the cases reported by Dr. Massey, but it was the only one that she had had an opportunity of treating. With reference to what Dr. Reyburn had said, she would say that in Dr. Massey's treatment of cancer of the breast she thought the electro-cautery might perhaps be used with advantage for making the puncture, thus closing up possible channels of absorption.

Dr. T. A. Pease said he heartily agreed with the statement that the knife was not admissible in such cases, and he would add that the curette was likewise inadmissible. He would never remove a gland unless it had broken down.

Dr. F. B. Bishop said he was very glad indeed to see these cases presented by Dr. Massey. They recalled that only two or three years ago, when everyone was using the X-ray for the treatment of cancer and for tubercular glands, he had been led to think that Dr. Massey and his method of treatment were going to be relegated to oblivion. Now, he felt that the X-ray and Dr. Massey's method were fast assuming their proper and useful position.

Dr. Snow said he had seen two of Dr. Massey's operations during the past year, which had been performed in cases in which surgery was impossible. They were not a go-between, but a last resort. They were cases of cancer of the rectum, and

the results had been really marvelous. A tumor three inches in diameter and three inches in depth came away, leaving clean margins, which healed rapidly.

Dr. Massey thanked the members for their interest in this subject. The glands were already suppurating in the case of the little girl presented, and in such a case the method of treatment which he employed was particularly easy of application. In such a case the current could be used much more freely, sometimes as high as a current strength of 15 milliamperes.

A USEFUL SCRAP BOOK.

Dr. A. C. Geyser said that during the last three years he had been in the habit of accumulating all periodicals dealing with electrotherapy, and he had found that a number of valuable articles appeared in other journals than those devoted to that particular field. His custom was to search every periodical coming to him for articles on electrotherapy, and to cut out such articles and index them in a proper scrapbook.



HIGH POTENTIAL CURRENTS AND CURRENTS OF HIGH FREQUENCY.*

BY WILLIAM BENHAM SNOW, M. D., NEW YORK.

The subject, *high frequency*, is one of unusual interest to a large number of physicians who are using apparatus producing currents of high potential. The currents of great frequency and high potential have for some time been a subject of consideration in France, and later, the works of Drs. Hedley, Chisholm Williams, and others in Great Britain have tended to popularize this method of electro-therapeutic administration. To an American, however, is accorded the credit by all foreign writers of introducing the first high-frequency current. To Dr. Morton of this city justly belongs the honor of having discovered the static induced current—the first of the great frequency and high-potential currents.

For the production of discharges of great frequency, high potential or voltage is an essential quality. Currents of great potential, however, are not essentially currents of high frequency.

A current of high frequency is characterized by a great number of interruptions, alternations, or oscillations per second, and it is not confined, as is too often supposed by uninstructed observers, to the discharges from vacuum tubes.

The three practical sources of these currents are the static machine, the Tesla, and the Ruhmkorff coils in connection with various resonators, step-ups, and transformers for condensing and interrupting the discharges. These two sources of current produce discharges which are distinctly different from each other, in certain physical effects.

The static currents of high frequency derived from one of the three types of static machines, the Holtz, the Toepler-Holtz, or the Wimshurst, have characteristics which cannot be produced by the combination of coils, resonators, and condensers. This quality is an intense, vibratory effect associated, even in currents of very high frequency, with the induction of muscular contractions. The currents derived from the static machine

* Read before the Clinical Society of the New York School of Physical Therapeutics, on Friday evening, January 15, 1904.

are also characterized by the minimum amperage or quantity, relative to their great potential or voltage.

The static induced current is a notable example of high-potential and high-frequency currents, and may be administered either in connection with vacuum tubes or by the employment of metal electrodes placed upon the surface of the patient, or in the mucous cavities.

The static wave-current, administered from one side of the source of energy, the patient being insulated, and the other pole connected by a direct metallic connection to the earth, the frequency of oscillation being regulated at the spark-gap by varying the speed of the machine and the distance between the balls of the discharging rods, is a current which can be administered by metal electrodes in direct contact with the skin with safety and comfort to the patient.

This current is distinctively *the current of one polarity*, oscillatory in character, surging from the surface of the electrode through all the tissues of the patient to the periphery, and, when not of too high frequency, returning by the same routes. The oscillations are synchronous with the discharges at the spark-gap. The effects produced are due not only to the general action described, but also to local effects, vibratory and stimulating, inducing muscular contractions, and capable of producing profound local sedation, elimination, and disengorgement of congested tissues. A valuable feature of the two static currents is the method of regulating the frequency and potentiality of the discharges by the spark-gap. The speed at which the revolving plates are moving, other things being equal, with the increase of velocity, increases the frequency, while the potential is measured by the length of the spark-gap. Another observation of importance is the fact that when with either of these currents the rate of speed is accelerated, other things being equal, a greater degree of muscular contraction will be produced; and that an increase of the potential induced by lengthening the spark-gap will produce the same effect. In other words, if a patient has been connected to a machine having an electrode connected to the muscles of the forearm, and the spark-gap has been opened to a point that the muscles have been thrown into a condition of commencing contraction, and at this juncture, either the speed of the machine is increased or the spark-gap lengthened, the

muscles will be thrown into a condition of rigid or tetanic contraction relative to the increase of speed, or extent to which the spark-gap is opened.

With the current derived from vacuum tubes in connection with the *Ruhmkorff* coil employing the ordinary electrolytic or spark interrupters, contractions are not appreciable. When a current is taken from the step-ups or resonators in connection with the static machine, the contractility is also lost.

Normally, however, when the connection is made directly with one side of the static machine the other side being connected with the earth, the effect is characterized by well-marked muscular contractions which increase with the acceleration of the rate of speed.

For therapeutic effects upon inflammatory conditions with the induction of circulatory drainage and acceleration of local metabolism, these vibratory influences, associated with muscular contraction, are invaluable. It is desirable, therefore, that some device be provided in connection with the discharges from high-frequency coil apparatus, which will produce these same effects of contraction when the coil is used. No conditions are so universally associated with disease as the congestive and inflammatory processes, and no influence, we believe, is so potent for relieving these conditions as electrical currents or discharges of high potential, when they induce muscular contraction in regulated frequencies and a penetrating capacity which will include the whole extent of the inflammatory process. For this reason we emphasize the importance in therapeutics of currents of relatively low frequency as best suited to overcome local stasis, thereby relieving acute and chronic processes of congestion.

Potential, it will be observed, is of incalculable value, especially when treating deep-seated inflammatory conditions—potential, associated with relatively low frequency. We have reason to believe from clinical observation that the currents of very high frequency are superficial in their effects and better suited to the treatment of affections of the skin and mucous membranes. Applied to these tissues, the discharges have a twofold effect, to wit, stimulating and antizymotic action. The latter effect is due to the production, in contact with the diseased structures, of two active chemical agents, nitrous acid and ozone, as well as other chemical effects characteristic of

these discharges. The effects of these chemical agents must also be taken into account when administrations are made for prolonged periods, lest their actions may be deleterious to exposed tissues.

There are other influences which add to the value of high-frequency currents administered with vacuum tubes which are common to all types of apparatus; namely, the productions of ether vibrations of an intensity comparable to the extreme rates of vibration produced by the various colored rays of the solar spectrum, and possibly greater.

The greater the amperage of the current passing to the vacuum tube the greater is the volume or number of these light and heat-vibrations produced. In conditions, therefore, in which these factors are of special value, the coil currents are more energetic than those produced from the static machine, requiring from the latter more prolonged administration to obtain the same results. In the consideration of the subject which has preceded we have suggested various *physiological effects* produced by these currents of high potential and high frequency.

The *physiological effects* which are available in therapeutics may be divided into three classes: (1) the *electrical effects*, which are due to the action of currents of high potential and small quantity; (2) the *derived mechanical effects*; and (3) the antiseptic or antizymotic effects of the discharges upon superficial tissues.

(1) *The electrical effect* of first importance, because it affects in greater measure congestive processes, is the induction of muscular contraction of a character not dependent upon the stimulation of motor points, but inducing intense fibrillary contraction of the mass of the muscular structure, and the muscular coats of the vascular system included in the region to which the current is administered.

(2) *The vibratory or mechanical effects* derived from the currents of high potential and moderate frequency, associated with the effects of contraction, are of unquestionable value, inducing an increase of local metabolism, and acting with the contractions as a *vis a tergo*, overcoming infiltrations and local stasis, and thereby relieving areas of congestion which are the conditions which render chronic processes unresponsive to drug medication.

The influence and the combined effect of muscular contraction and vibration upon acute and inflammatory processes is the foundation for the great success of modern electro-therapeutics, because of their effects on congestion and infiltration. It is not the currents of high frequency, but the currents of great potential and moderate frequency that are most valuable in producing these effects.

Polarization effects are also induced upon all of the tissues pervaded by the current in the interpolar regions when currents are applied, as with the static induced current employing two electrodes; and in all of the tissues of the patient when administered to him, when insulated, from one side of the source of electrical energy. With the *wave current*, the effects of these polarization effects are best studied from the standpoint of therapeutic results associated with the treatment of various nutritional derangements. They are evidenced by a general improvement of the nutritive processes associated with an increased consumption of oxygen and elimination of carbon dioxide, and also an increased elimination of solids with the urine. Associated with these results is an improvement in appetite, gain in body weight, and restoration of the normal proportion of the red and white corpuscles in the blood—anæmia disappearing, as a rule, in all patients not affected by some organic disease. The effects are uniformly obtained, in the writer's experience, from the employment of the static wave-current directed either to the treatment of local or general conditions, and are associated with a diminution of nervous irritability and the recovery of the normal physical status. These same results are reported as derived from the employment of the D'Arsonval currents administered in connection with the auto-condensation chair, which has been described by Drs. Headly, Chisholm Williams, and other writers.

Electrolysis and cataphoresis from the currents of high potential and small quantity, associated with ionic transposition, are significant, and do not call for consideration.

(3) *The antiseptic or antizymotic* influence of high potential discharges in the form of spray, brush discharge, or in association with the vacuum tubes is beneficial in the treatment of superficial conditions in the skin and mucous membranes, associated with germ proliferation. It must be borne in mind, however, that these electrical discharges are in reality emana-

tions from the most superficial portions of the integument and other surfaces, and are not productive of these effects elsewhere.

Recurrent muscular contractions are of so great importance in the treatment of inflammatory processes that apparatus should be designed with a view to producing such contractions for the treatment of these conditions. In this connection it must be borne in mind that the currents of low potential derived from coarse-wire faradic coils are not adapted to produce the same effects upon the tissues, but high potential is requisite.

The therapeutics of high-potential electric currents covers a wide range of application, and for purpose of distinction it is best to consider their indications with reference to the character of interruption, (1) as *high-potential currents of low or regulated frequency*, and (2) as *high-potential currents of great frequency*. It has been found in the writer's experience, as said above, that the former currents are best adapted to the treatment of inflammatory affections and the other conditions usually associated with them, including errors of general metabolism, as high arterial tension, contractures, and other spasmodic conditions; while the currents of high potential and great frequency are adapted to the treatment of various superficial affections and, as is verified by some observers, are also valuable in the treatment of various types of septic and tubercular infection.

For the effects upon general nutrition and metabolism the writer prefers the currents of low frequency.

The currents of high potential and low or regulated frequency are indicated in all inflammatory affections except those characterized by the presence of necrosis, and of septic or other germ processes.

The effects of these currents upon inflammatory processes are, we repeat, due to the two important actions associated with currents of low frequency. The effect of the contractions of muscular structures surrounding an inflammatory area which has become the site of a local stasis is to impel outward the accumulated blood and other inflammatory products through the blood and lymph channels, relieving the tissues of infiltration. This is accomplished through the action both upon the circulatory apparatus and end-organ metabolism. Coincident with the relief of congestion, a healthy reparative action is

instituted, and in early cases the result is salutary, terminating in a prompt cure of what might have been a prolonged and aggravated condition. With the slow interruptions and a potential relative to the depth of the parts involved, the recurrent *vis a tergo* mechanically clears out or drains the affected region, whereas the currents of high frequency are deficient in mechanical action and do not give the push or impulsion onward, and are consequently generally ineffective in these conditions. Experience in the employment of these methods of treatment in many cases in which the results are uniformly verified leads one to expect to succeed in every uncomplicated inflammatory condition.

The treatment of *acute neuritis* well illustrates the principles involved. We have cured twenty-six cases of acute sciatica of from three to ten days' standing, each within a period of ten days, and in none of the cases has there been a relapse. In chronic cases of sciatica, uncomplicated by necrosis or suppurative processes, the time necessary to effect permanent results will vary from one to three months; but in all uncomplicated cases the result is eminently satisfactory. In the other cases of neuritis the results are practically the same except in *chronic tic douloureux*, in which these forms of treatment seem to have utterly failed. In the acute cases, however, it is different. We have been successful in the treatment of every case (five in number) of *acute tic douloureux*—cases which came under observation within the first weeks of the affection—and from these results there is little reason to expect other than a successful issue in acute cases. When, however, infiltration and inflammatory deposits have accumulated to considerable extent in the bony canal, as in chronic cases, it is impossible by these means to relieve the condition.

In the treatment of *rheumatoid arthritis* there is no method, we believe, that promises so much as the currents of high potential and moderate frequency. The writer has had under observation upwards of sixty cases of this distressing affection, and in every instance has been enabled to give a large measure of relief. Six cases of not more than two years' standing have been cured, one in a child three years of age.

Conditions which well illustrate the *modus operandi* of these modalities are sprains and other traumatic conditions. In all cases where there has not been a solution of

continuity, as the severance of attachment of a ligament, the results of treatment are uniformly successful in from three to five days, leaving the part in absolutely as good condition as before the accident occurred. Statements of this sort, to those who are not familiar with the method of treatment, may seem to be an exaggeration, but there are a large number of physicians who are prepared to verify them. •

In the treatment of acute and inflammatory processes leading to abscess, such as suppurative tonsilitis, whitlows, and carbuncles, the administration of the various high-potential modalities will invariably cut short cases in which suppuration has not already intervened. This, too, would seem impossible to those who are not familiar with the plan of treatment, but when it is realized that we overcome a local stasis, as before stated, and produce a normal circulatory drainage and elimination, and assist nature in throwing off the initial cause, which is insignificant in comparison with the conditions which follow, the result may be better appreciated.

Until within a recent period it has been the dictum of the electro-therapeutists and profession at large that acute inflammatory conditions were not to be treated by electricity, but it is now a well-established fact that by the use of high-potential currents of small quantity, in the first stage of acute affections, the most prompt and satisfactory results are obtained.

Another distressing condition which has marked for cripples so many unfortunate children—*anterior poliomyelitis*—yields to the early application of the wave current as we believe to no other plan of treatment. The administration of the static wave current over the region of the cord corresponding to the region affected relieves the local hyperæmia or congestion, resulting in relative or complete restoration in proportion to the time that has intervened since the onset of the trouble. In other words, cases treated in this manner within the first days may be completely cured by a few treatments, and the prognosis is fairly good, within two months after the onset of the trouble. The prognosis is relative to the number of neurons that have perished under the pressure and congestion. The writer has already had under observation upwards of ten cases of infantile paralysis in which these little sufferers have been remarkably improved by this plan of treatment. The administration of the

wave current in children is free from all objection, being painless and absolutely innocuous.

Locomotor ataxia may be considered a chronic congestive process of the spinal cord, and the results of treatment with low frequency and high-potential currents, and static sparks, in this condition is followed by a degree of improvement which seems at times at variance with the recognized pathology of the disease. Probably no other treatment at the present time promises these sufferers so great a degree of improvement, and a fair measure of assurance that the disease can be brought to a *statu quo*.

One more class of conditions coming under this category deserves a passing mention, viz., the chronic and acute *inflammatory joint affections*. Except cases of gonorrheal rheumatism, tubercular arthritis, and diseases associated with the presence of pus or malignant processes, these cases are invariably relieved and generally cured when ankylosis, or destruction of the cartilages of the joints, has not already taken place. If these truths were recognized as they should be, marked changes would be instituted in orthopedics.

In addition to conditions inflammatory in character, the associated improvement in general metabolism and nutrition concomitant with the treatment of all these cases is remarkable. The general lessening of the nervous irritability, restoration of appetite with increase in body weight and a return to normal proportions of the constituents of the blood, we repeat, is remarkable, and has indicated the adoption of this plan of treatment in a large class of nutritional derangements, including Bright's disease, acute cirrhosis of the liver, diabetes, anæmia, as well as the functional neuroses. Already papers have been written by several eminent authorities upon the success of these modalities in the treatment of Bright's disease, and from the principle of their action upon inflammatory processes, nothing would seem more rational in selected cases.

The currents of *high potential and great frequency*, which are attracting much attention, deserve consideration generally in a different class of conditions. First, in conjunction with the vacuum tubes, these currents are administered in different degrees of frequency or of interrupted frequency. We believe, even with these, that the greatest degree of frequency, unless it may be so interrupted as to

produce, in connection with the high-frequency administration, regularly interrupted muscular contractions, their field of application is very much curtailed. In other words, when these applications are made in the closed cavities of the body, where some congested inflammatory process is also present, if they can be so administered as to produce these contractions in connection with the characteristic electrical discharges, they will be productive of a greater degree of benefit. Those who have administered high-frequency currents in conditions associated with erosions of the os uteri from the static machine, without the intervention of high-frequency apparatus, have succeeded usually in relieving not only the ulceration, but the congested and enlarged condition of the body of the organ. While administered from the static machine, associated with the D'Arsonval or Tesla high-frequency apparatus, the results have not been so successful either in healing the erosions or in relieving the congested condition of the body of the uterus. It is this vibratory stimulation associated with the muscular contraction which induces circulatory drainage, relieves the congested organ, and promotes the healing of the resulting ulceration.

In cases of *metrorrhagia* and *subinvolution* with this form of treatment, the results have been generally successful where polyps, villi, or fibroids have not complicated the condition.

In *vaginismus* the results are also successful, if the administration is made with reference to the treatment of a usually associated congestive condition employing slow or interrupted frequency. The number of cases of *salpingitis* which have been reported relieved or cured by this method of treatment is already sufficiently large to justify the expectation of generally favorable results from its employment. We repeat, however, that for the best results with the glass vacuum tubes the connection should be made directly from the negative side of the machine to the electrode in position, and the opposite side of the current be grounded. If instead of a static machine a coil is employed in connection with a high-frequency apparatus, there should be some device for interrupting the discharges or the employment of some means of producing regularly interrupted muscular contractions of not too great frequency, if the best results are to be obtained. The special indications for the employment of high-frequency apparatus, otherwise than with

conditions producing muscular contraction, seem to be in the treatment of superficial skin diseases, and as is shown by some authorities when applied over septic processes. It has been shown by Chisholm Williams and others that currents applied in this way, and in connection with the auto-condensation couch, are remarkably successful in the treatment of tubercular and septic conditions. The indications are also patent, and success is to be expected in the treatment of *specific and gonorrheal affections*. Good results have already been obtained in the treatment of *specific vaginitis*, urethritis, and gleet from the direct application of these modalities. It is true also that good results are obtained in the treatment of many other germ processes. That this effect is due to direct antiseptic action, except the administration is brought into direct contact with the surface affected, is doubtful. It seems more likely that the modality may act by improving the local resistance of the tissues.

It seems probable, therefore, that the *currents of high potential and moderate frequency*, associated with the production of muscular contraction, are the currents best calculated for the treatment of local inflammatory conditions and the influence upon general metabolism, while the *currents of high-potential and great frequency* are better suited to the treatment of superficial conditions and localized septic processes.



VIBRATIONS AND NERVE VIBRATIONS WITHOUT
THE MEDIUM OF MACHINES, THEIR TECHNIQUE
AND THERAPEUTIC VALUE IN ACUTE AND
CHRONIC DISEASES.*

BY R. STRENSCH, M. D., NEW YORK.

Ladies and Gentlemen:

The subject upon which I am called to speak to-night has doubtless become familiar to everyone present in the last few years since science has taken up "vibration," the foremost law of nature, energetically and conscientiously.

The latest scientific discoveries prove beyond doubt that every phenomenon in nature depends upon matter in motion, or better, in vibration. Also the human body shows itself as a system of component molecules in constant vibration until death occurs. Vibration is, therefore, "Life," revealing to us the secret of the Universe! This being a fact, we must accept it as a law that application of vibration mechanically will keep up and restore the equipoise of the human body, and consequently, that vibratile treatment, if properly done, must be considered as the most natural and most effective therapeutic agent for the relief of human ills!

In health all ions of the body tissues are in high, the normal, vibration; in disease and decay the vibration is lessened and abnormal; in death the vibration has ceased. Therefore, in order to restore health, it becomes necessary to raise the vibration of the ions of the body to their standard frequency. Nature never intended to accomplish this by drugs, which are not found on the list of conditions necessary for life and health, such conditions being: proper air, light, water, food, proper limits of temperature and of atmospheric pressure. It is clear that the way indicated by nature is to follow the law of nature, and this implies mechanical application of vibration!

Application of vibration to the human body therapeutically has been practiced since the beginning of the eighteenth century. Ling and his pupils also had an idea of this direct mechanic treatment and its beneficial results, as we learn from "*Georgii Traitement des Maladies par le Mouvement*," Paris,

* Read before the Clinical Society of the New York School of Physical Therapeutics, Friday, May 20, 1904.

1847. They observed the effective influence traveling from front to back in the direction of the sinus longitudinalis and of the sinus transversus, and applied, therefore, vibrations successfully in congestion of the brain. Heinrich Kellgren and his brother Arvid developed this method about thirty years ago, but they used it only in connection with massage. As a system complete in itself, without accompaniment of drugs, electricity, or massage, its great value was first recognized and demonstrated by the writer.

When I first came to this country, in 1891, this treatment was looked upon skeptically by our hyper-conservative medical profession, and, like electricity, it was considered as a doubtful remedy, until two prominent specialists, the elder Sayre and our deeply mourned Robert Newman, by being treated became convinced of the therapeutic value of my method. Also the electric treatment, until recent years, was looked down upon and left largely in the hands of quacks and charlatans, who, ignorant of its laws and its physiological action, have applied it indiscriminately and thereby brought it into disrepute. And yet these two methods, besides radiotherapy and organotherapy, are bound to be the principal remedial agents of the modern physician!

By special invitation I spoke in the following year about the vibration treatment in the Electric Department of the New York Post-Graduate School, demonstrating it on the bodies of a young man and woman. Some of the young physicians were unable to understand how I could feel the single nerves with my fingers, even the sciatic, the largest nerve in our body. Dr. Morton came to the conclusion that he could produce nerve vibrations by the electric current. By accident, at the Academy of Medicine, I found my own opposite view verified. Dr. J. M. Granville of London, in his book "Nerve Vibration and Excitement" (published by J. & A. Churchill, London, 1883), proves intelligently and positively that the nerve tissue is only a good conductor of electricity, but that the latter can by no means cause nerves to vibrate!

At that time I called upon a number of the most prominent neurologists to induce them to investigate my method. But only Landon Carter Gray was interested so far as to have me demonstrate it on his own body. He acknowledged the beneficial influence of the vibration, yet pointed out that the applica-

tion of this method requires considerably more time than to write prescriptions, which would permit an office practice of from 30 to 60 patients while not more than eight to ten can be treated by vibrations, as it is exhausting work—and this by far pays less.

Dr. Sayre, who was greatly interested in my method, called my attention to its very occasional mention in English medical journals. But known was the vibratile treatment only to a very few practitioners. Dr. George Schoeps of New York, throat and nose specialist, applied vibrations after cauterization in order to subdue the following local inflammation. Dr. H. V. Barclay of Philadelphia stated in the *Medical Times* of March, 1899, in his paper "The Treatment of Chronic Heart Disease by Baths and Exercises": "Vibration over the region of the heart and pressure on the vagus nerve are administered to exert a special influence on the heart itself. Part of this action is of course produced by contact with the skin, but the effect is so pronounced that it would be unreasonable to deny that the action is not produced by direct influence on the centers of the heart itself, and through them by reflex action on the cardiac and vaso-motor centers of the brain."

Since that year the medical profession awakened more and more to the understanding of the great truth and value lying in vibrations, and the vibration theory has now reached its recognition as one of the most important therapeutic agents for direct practical use! As a result, a number of machines have been invented to induce vibrations, but so far not one is following the proper intention and filling the place of the hand in every regard, though some of them can be considered as fairly satisfactory for general vibration of the body and that of organs, but not for nerve vibrations, while most of them produce only an extremely rapid massage.

The title of my paper speaks of "Vibrations and Nerve Vibrations," the first meaning the vibratile treatment of organs, the latter concerning that of single nerves. I once more wish to mention that for the production of either I never have used machines, since the hand, with its delicate and educated sense of touch, can alone follow the changes occurring in the state of the subject and so adjust treatment even to acute inflammatory cases as to avoid additional pain, and to insure the desired re-

sults. And yet there is no need to expose the patient, unless for the purpose of a special examination.

The "vibrations" are principally executed with the palmar surface of the end-phalanges of the fingers, sometimes with the palm of the hand. The movements made by the relaxed wrist are abduction and adduction—fingers of respective hand remaining fixed in touch with the part under treatment. In the elbow-joint extremely slight motions of flexing and extending are executed. The under-arm, the hand with its joints and bones, form between the elbow-joint and finger-tips the links of a chain, by which the movement is conducted undulatorily to the seat of the treated organ. The joints must not be held stiff, and are to be extended only so far that the motions are entirely elastic. The finger-tips must not be put on sharply, the hand kept as parallel as possible to the surface to be treated, else the movements will become hard and knocking, the patient will contract his muscles, and the effect is greatly impaired. By extremely quick following motions the vibrations become originated.

The motions of the muscles must be so slight that they can be scarcely felt by one who lays his hand upon the treating arm. By no means must the muscles of shoulder, arm, and hand be contracted continuously, else the movements will also become hard. The physician loses the intensity and the feeling of pressure, and it will be impossible to execute them longer than a few minutes. What I have said will give an idea of the fineness of the vibrations, of which two to three hundred can be given within one minute. Moreover, stimulation, sedation, inhibition are influenced by the force behind the vibrations or impulses and under no circumstances by a change in the frequency of the vibrations or impulses!

It would require a series of lectures to describe the vibrations for the different organs. I only will mention that the eye and ear can be treated in an extremely satisfactory way, which machines never can do, as shown from the case of the Duchess of Marlborough, who could not stand the intense pain caused. The same I maintain regarding the treatment of the heart, because a too heavy hand or a stiff wrist may cause the patient even to faint.

"Nerve vibrations" can be originated by two methods: either by friction across the nerve, like the harpist plays on the

cords of the harp—or by making vibrations over the nerve-tissue. In the latter case the finger-tips follow the course of the nerve in centripetal direction, or they are kept motionless, and vibrations are made over the painful points. If frictions or vibrations are to be chosen, will depend on the situation and surroundings of the nerve as well as on the cause of the affection.

The first method can be shown best at the *nervus medianus*. The arm of the patient is to be abducted until becoming horizontal, then the nerve will enter from the axilla and can be felt as a cord lying outside of the *arteria brachialis*. If we now use quick friction across as described above, a feeling similar to an electric shock will be caused.

For the second method is best selected the *nervus supra-orbitalis*, which is lying directly on the frontal bone. Very important it is that the tissues between nerve and finger, forming one with the latter, move with the nerve, as otherwise the frictions do not reach their destination and lose their purpose.

This mechanic method produces:

- (1) Strengthening of the nervous energy,
- (2) Mitigation of pain,
- (3) Contraction of the small blood-vessels,
- (4) Augmentation of secretion of the glands,
- (5) Impulse of the muscles to contract,
- (6) Decrease of temperature.

It may be mentioned here, that "pressure" upon the nerve proved of good effect in many cases of migraine and neuralgia.

According to my experiences there cannot be the least doubt that we possess in these "vibrations and nerve vibrations" a most powerful weapon against the progression of almost all diseases of the nervous system, and a sure cure for most of them. But to enter into the details as to such diseases, and through which nerves they can be successfully reached, would extend far beyond the scope of this paper. Therefore, I may be permitted to report a number of cases of a widely different nature, as my practice has brought them along. I treated those purely by vibrations or nerve vibrations without any adjunct whatsoever, sparing by their direct action upon organs and nerve-tissue the digestive organs as medium entirely.

Case 1.—When I came first to this country I was called in consultation by Dr. Robert Newman to a prominent patient,

Judge C. C. H., sixty-one years of age, for many years partner of President Harrison, stricken a year before by apoplexia cerebri sanguini with following paralysis of the entire left side of his body. The treatment by drugs, electricity, and massage had not improved his state within that period in the least. After thorough physical examination I told Dr. Newman that my method would prove successful and a threatening repetition of the stroke avoided, if I could apply the same daily. For some reason it was decided that Dr. N. and myself should treat the judge at alternating days. I began November 10, 1891, and at Christmas Eve the patient was able to walk at my arm and on one crutch through a long hall of his hotel. The following January 1, I cured him by vibrations of acute orchitis within forty-eight hours, and January 6 a second stroke of apoplexy occurred in my very presence. Now I was requested to give him daily treatment, and in April I could dismiss him for Indianapolis, speech, face, arm, and leg entirely recovered and normal, only the motion of his left ankle slightly impaired, being able to walk with one cane and if he wanted without any. He lived ten years more in perfect health, dying accidentally in Indianapolis by blood-poisoning, without any further stroke, as I had been able to strengthen the walls of the small blood-vessels in his brain enough to withstand the pressure of the regulated blood circulation. One year after my treatment and one year before his death he was, by my advice, successfully operated upon for tumor at the prostata glands, the second time by Robert T. Morris.

Case 2.—Mrs. L. F. H., aged forty-nine years, was brought to me by her brother, Dr. F., a prominent nerve specialist of Indianapolis, for uterine hemorrhages resulting from chronic parenchymatous metritis. In two weeks the metrorrhagia disappeared, and the patient was completely cured within ten weeks.

Case 3.—L. W. C., sixty-six years, bank president, for five years under treatment of noted physicians, dying of general exhaustion from organic disease. This case was diagnosed as "ulcer at the neck of the bladder," as cystitis, etc. Within the last three weeks he had lost forty-seven pounds, could not retain food, and could, on account of extreme pain, only sleep on knees and elbows, for fifteen minutes at a time. As his body was thoroughly emaciated, it was no difficulty to make my

diagnosis for stone in the bladder of three to four inches long, without sound, simply through the abdominal wall. By applying exclusively my method I was able to reduce, within three weeks, the formation of pus in his urine from two-thirds of a tumbler to one-half a teaspoonful, his stomach took up work again, and after five months his entire system was recuperated enough to undergo suprapubic cystotomy—in spite of the irritating cause, the stone. The operation, done in this building by Tod Helmuth, was successful, and the patient enjoyed within these last twelve years the best of health, traveling every winter to California from this State. A fortnight ago he wrote me: "At the age of seventy-eight I am enjoying work in my garden."

Case 4.—Mrs. E. C., fifty-nine years of age, was cured within four months from nerve prostration of five years' standing.

Case 5.—Mrs. S. H., sixty-four years of age, chronic bronchitis and gastritis of eighteen years' standing, was cured after two months' treatment.

Case 6.—Governor D. R. B., forty-five years old, chronic headache for two years. Ten applications of nerve vibration cured him entirely.

Case 7.—Judge L. H. N., seventy-two years, fainting spells, unable to co-ordinate his thoughts; three months' treatment enabled him to take up his law-practice again for the last twelve years.

Case 8.—Miss J. K., seventy-four years old, chronic enteritis, dyspepsia, and bronchitis; five months' treatment created thorough cure.

Case 9.—Miss F. H., twenty-four years, nervous dyspepsia of one year's standing, cured by twelve treatments.

Case 10.—Mrs. A. W., sixty years, catalepsy of thirty years, complicated with chronic constipation of fifteen years' standing. After being two and one-half years under my treatment in my sanitarium and almost well, she contracted concussion of the brain with acute mania following. I called Dr. Allen Fitch in consultation, who advised sending her to an insane asylum, also did the specialist brought by her husband from Philadelphia. I refused to do so, and attending to her night and day, I brought her in two weeks to her senses, and dismissed her as well, though still convalescent, two months later.

Case 11.—Mr. L. A., fifty-six years; impotency; eleven treatments.

Case 12.—Rev. Dr. E. B., seventy-five years old, critically ill with pneumonia; after three days' treatment he was out of bed, and lived for years.

Case 13.—Mr. C. T., thirty-six years, chronic cystitis; forty-five treatments.

Case 14.—Mrs. G. N. I., thirty-eight years, epilepsy of twelve years, apparently caused by child-bearing. From the first treatment no fits any more, while they had occurred until then every midnight. Three and one-half months' treatment.

Case 15.—E. W. D., forty-five years, compound fracture of leg, set by Dr. Carl Beck and referred to me by him. Seven treatments.

Case 16.—Mrs. P., seventy-eight years, general exhaustion of all organs, dying of old age, as the family physician diagnosed, who measured her life only twenty-four hours longer. I found her in coma, heart and other vital organs faintly active. My method, applied in this case exceptionally three times daily, strengthened her vitality to such a degree that her organs resumed their work to full extent. After one week she was out of bed, and after a fortnight she could go out again, living afterward for years.

Case 17.—Mr. D. B., thirty-seven years, locomotor ataxia; two months' treatment stopped severe pain and made the patient generally more comfortable.

Case 18.—Mrs. Dr. C., thirty-five years, sciatica of five years; eleven treatments.

Case 19.—Mr. B., twenty-five years, severe tonsilitis; five treatments opened the abscess.

Case 20.—Miss W., fifty-four years, syringo-myelia of twenty years' standing; had been under treatment of several high-standing nerve specialists of New York. Six months' treatment at my sanitarium caused general improvement, lessening of the intense pain, and better use of her limbs.

Case 21.—Mr. F. H., forty-five years, chronic myelitis as sequelæ of alcoholism for which he underwent the gold-cure seven years before; two months' application of nerve vibration resulted in an absolute cure.

Case 22.—Little Y., twelve years, St. Vitus' dance; twenty-three treatments were sufficient for permanent cure.

Case 23.—Miss E. E., age thirty-eight years, hysteric neurasthenia of three years' standing complicated with chronic dyspepsia and headache, was dismissed as convalescent after three months' treatment.

Case 24.—Miss N. C. M., aged thirty-seven years, after undergoing, by my advice, a laparotomy, was cured from neurasthenia in my sanitarium. A year later she suffered a relapse by great nervous strain complicated by severe insomnia and morphinism. Her mental state was in a most severe condition

and suicide mania present, when she returned under my care, after her conscientious physician had fought the disease in vain by medication. I consider this one of my hardest cases, but also here I was able to break the morphine habit and to save the patient from every phasis of her desperate state, applying no other means than my method of vibration and nerve vibration! The patient is present.

Case 25.—Mrs. A. G., thirty years, suffering from a severe and chronic tic douloureux; came under my treatment last summer for a period of about three weeks. Though the patient could not stay until entirely cured, the accompanying headache had disappeared and the attacks of tic douloureux became rarer and by far less severe.

Case 26.—Mrs. C. S., forty-four years, peritonitis; dismissed as well after three days; treated twice daily.

Case 27.—Mrs. D., thirty years, suffering for four weeks from intercostal neuralgia and insomnia, for which her physician could do nothing; was freed of pain and sleeplessness by three treatments.

The method has proved especially of value, when the patient could not be resuscitated from the influence of ether and chloroform. After all other efforts had failed, vibrations over the heart for thirty-five minutes brought the patients back to life in four different instances.

Coming to the end of my paper, I wish to state that this kind of treatment is of extreme value in diseases of the stomach, heart, and eyes; and I warn especially against the use of machines for the latter two, as these organs can only bear the most tender vibrations. Should machines be constructed to replace the hand entirely, I would be more than glad, as it is exhausting work to vibrate the nerves of the patient manually, and what the latter gains the operator to some extent loses; besides, chronic cases require considerable time, and patients are often too impatient to await the sure success! So far, not one machine has been made so perfect as to enable the physician to affect a nerve along its course. According to my experience I take the full right to consider this method of "Vibrations and Nerve Vibrations" as the curative agent in all diseases not of an infectious order, and not belonging to the empire of the surgeon, and their great value is the more to be appreciated as they cannot possibly do harm! The treatment is in the full sense of the word rejuvenating, giving new and lasting vitality, combating even approaching death, for as the blood is sent circulating with renewed vigor through the veins, exhausted tissues are replaced by vitalized ones, and the infirmities due to the loss of nerve-force are banished. It gives me great satisfaction that I was able to establish one record in my professional career, namely: Within my thirteen years' practice I never lost a patient by death!

Editorial.

ASSOCIATION OF PHYSICAL METHODS.

FORMERLY physicians who employed electricity therapeutically were known as electro-therapeutists. At the present time, however, there are very few physicians, who have formerly made use of electricity, who are not combining its application with other methods. It is found, as in the other fields of therapeutics, that in the symptom-complex with which they are constantly brought in contact, one physical measure does not so well meet varied conditions as a combination. This fact is leading to the general adoption by progressive therapeutists of all of the measures which space in their offices and circumstances will permit them to include. The adoption of these measures by men who formerly were not employing any of them causes the field to be looked upon less as a specialty and more as recognized methods that must be employed by all physicians who would consult the best interests of their patients. No special appellation in the future will designate the men who are employing them. They will be first and last physicians.

The association of these methods leads up to a study which calls more and more for a thorough investigation looking to the selections of the ones best adapted to the treatment of various diseases. There is probably less necessity in the use of the physical agencies for investigating idiosyncrasy, as they seem to be adaptable to all sorts of individuals. The employment of these measures at the present time is in the stage of development, and while success from their employment has already placed them upon a permanent footing, it will be some time before the exact relative place for each can be determined.

While static electricity meets an immense range of conditions, especially of the types associated with congestions and inactive metabolism, it is not in many instances adapted to meet all of the demands of some cases in which it is generally indicated, but effects better results when employed in combination with exercise, diet, light, mechanical vibration, or one or more other means.

Mechanical vibration, from its physical characteristic as a stimulating and inhibitory agent, is generally found to give the best results when employed in combination with other physical agents. Its administration requires skill and attention to the principles of application, demanding time and study in order to acquire a perfect technique and discrimination as to indication and treatment of individual cases.

Dietetics, in the treatment of all conditions, should receive a degree of attention which it has not been accorded in the past, and no matter what other method of treatment is employed or what the case, attention to diet is always a prerequisite.

Physical exercise must be recognized under all conditions as one of the requisites for the maintenance or restoration to health, and no matter what methods are employed in order to meet a special indication, systematic and outdoor exercise should constitute a portion of the treatment.

Light plays a most important rôle in the preservation of a healthy existence, and in a concentrated form, as from the electric arc, acts in a peculiarly energetic and beneficial manner. The best results, however, are to be obtained from its association with the other agencies. The uses of heat and cold as employed with light, dry hot air, and water are agencies of untold value.

The art of association of physical methods and selection to meet the indications as they arise is one of the most important subjects which face the profession to-day. Those who are prejudiced in favor of the employment of measures and methods suggested in the older *Materia Medica*, are the ones who have not learned to appreciate the truth of this statement. The large number, however, of those who have employed several of them appreciate fully the necessity for a discriminating study, with a view to best meeting the indications as they arise.

The time is not distant when in every large town in the country some physicians will be employing the physical agencies almost to the exclusion of drugs, and institutions devoted to this sort of practice will be very common throughout the civilized world.

MEETINGS OF THE INTERNATIONAL SOCIETIES AND THE CONGRESS OF ELECTRO-THERAPEUTICS.

WE herewith publish a list of the papers to be read at the coming meetings of the American Electro-Therapeutic Association, The International Congress of St. Louis, and the American Roentgen Ray Society. These meetings are to be held as will be seen by the dates appended, at so nearly the same time that it will be possible for those interested in electro-therapeutics to attend some of the sessions of each while visiting the Exposition in September.

It is to be regretted, however, that the arrangements for these sessions is such that the hours will conflict and it is to be hoped that those who have the matter in charge will arrange to make it convenient to those interested.

When it is understood that the Coliseum, where it is designed that the meeting of the Congress shall be held is one hour's ride from the Exposition Grounds and held during the morning hours at the same time which has been chosen for the meeting of the American Electro-Therapeutic Association, it will be appreciated that the sessions of both will be very irregularly attended; whereas if the sessions were held both upon the grounds as the session of the American Electro-Therapeutic Association will be at the Inside Inn, and at hours which did not conflict, it would be very highly appreciated by many who would like to attend all of both sessions. It is not too late, we trust, to arrange these meetings so that they will not conflict and that valuable time will not be lost in riding back and forth from the Coliseum.

INTERNATIONAL ELECTRICAL CONGRESS OF ST. LOUIS. (12-17TH SEPTEMBER, 1904.)

We are informed that under the auspices of the Louisiana Purchase Exposition, an International Electrical Congress will be held in St. Louis during the week 12th to 17th of September.

The Congress will be divided into two parts, namely:

(1) A chamber of government delegates appointed by the various governments of the world, invitations to which were

issued at the beginning of the year from the United States Government. The transactions of the chamber of delegates will relate to matters affecting international questions of electrical units, standards, and the like.

(2) The Congress at large, divided into eight sections, as follows:

General Theory—Section A, Mathematical, Experimental.

Applications—Section B, General applications; Section C, Electrochemistry; Section D, Electric Power Transmission; Section E, Electric Light and Distribution; Section F, Electric Transportation; Section G, Electric Communication; Section H, Electro-Therapeutics.

Our readers will be interested in Section H—the Electro-Therapeutic Section.

The President of the Committee of Organization is Professor Elihu Thomson of Lynn, Mass. The Vice-Presidents are: B. J. Arnold, Professor H. S. Carhart, Professor W. E. Goldsborough, C. F. Scott, Dr. S. W. Stratton.

The Chairman of Section H is Dr. W. J. Morton, New York City, and the Secretary is Mr. W. J. Jenks, New York City.

Three hundred and forty-three official invitations were issued some months ago to well-known workers in electricity, inviting papers for the Congress. One hundred and sixty-eight of these invitations were issued to persons residing in countries outside of North America. As a result of these invitations, 105 American and 59 foreign specially prepared papers are promised to the Congress. Of these, 5 foreign and 15 American papers are in Section H, as follow:

SECTION H.

Electro-Therapeutics.—Chairman, Dr. W. J. Morton; Secretary, Mr. W. J. Jenks.

Name of Author.	Title of Paper.
Professor M. Benedict,	"Radiology in the Pathology of the Brain."
Dr. J. Bergonie,	Subject not announced.
M. le Docteur G. O'Farrill,	"Some Improvements in Generator Apparatus of High-Frequency Currents."
Professor S. Schatzky,	"The Ionic Theory as Biological Basis for the Therapeutic Action of Electricity."
Professor S. Schatzky,	"Experimental Researches on the Treatment of Tuberculosis by Constant Current."

Name of Author.	Title of Paper.
Dr. J. Riviere,	"Physico-Therapy of Neurasthenia."
Dr. Carl Beck,	"Recent Advances in Roentgen Ray Science."
Dr. Russell H. Boggs,	"Diagnosis of Calculi by X-Rays."
Dr. G. G. Burdick,	"Radiations in Therapeutics."
Dr. Margaret A. Cleaves,	"The Nature of the Changes Established in Living Tissue by the Action of Oxidizable Metals at the Anode."
Dr. Charles R. Dickson,	"Some Observations upon the Treatment of Lupus Vulgaris by Phototherapy, Radiotherapy, and Otherwise."
Dr. Emil H. Grubbe,	"X-Rays and Radio-Active Substances as Therapeutic Agents."
Dr. T. Proctor Hall,	"The Principles of Electro-Therapeutics."
Dr. J. H. Kellogg,	"Electro-Therapeutics."
Professor Jacques Loeb,	"The Control of Life Phenomena by Electrolytes."
Dr. John Williams Langley,	"The Purification of Water for Drinking by Electricity."
Dr. G. Betton Massey,	"The Cathodic Diffusion of Metallic Ions in the Destructive Sterilization of Cancer and Tuberculous Deposits."
Dr. W. J. Morton,	"Artificial Fluorescence of the Human Organism as a Means of Treating Disease."
Dr. C. S. Neiswanger,	"Static Electricity in Chronic Nephritis."
Dr. Clarence E. Skinner,	"A Large Fibro-Sarcoma Treated by X-Radiance."
Dr. William Benham Snow,	"Static Electricity in Therapeutics."

Up to the 30th of June, 1787 adhesions to the Congress had been received, of which about 1300 have paid their subscriptions of five dollars each. Of these, 291 are from countries outside of North America. The following societies will coöperate with the Congress at St. Louis, by holding simultaneous conventions and joint sessions: The American Institute of Electrical Engineers, The American Electro-Chemical Society, The American Physical Society, The American Electro-Therapeutic Association, The Association of Municipal Electricians.

The following societies will coöperate with the Congress by appointing delegates: The National Electric Light Association, The Association of Edison Illuminating Companies, The Société Internationale des Electriciens, The Schweizerischer Electro technischer Verein.

It is expected that various other European societies will also coöperate.

Fourteen thousand six hundred invitations have been issued to persons interested in electricity all over the world, inviting them to join the Congress. It is expected that the Transactions of the Congress will attain two or three large volumes. Persons interested in electricity and who desire to join the Congress should apply to the General Secretary, Dr. A. E. Kennelly, Harvard University, Cambridge, Mass.

Each member of the Congress is entitled to receive one set of the Transactions. It is intended to issue the Transactions of the Congress, when printed, to libraries and non-members for ten dollars per set.

THE PRELIMINARY PROGRAMME OF THE PAPERS
TO BE READ BEFORE THE FOURTEENTH AN-
NUAL MEETING OF THE AMERICAN ELEC-
TRO-THERAPEUTIC ASSOCIATION ON
THE 12TH, 13TH, 14TH, 15TH, AND
16TH OF SEPTEMBER, 1904.

The preliminary programme to date, subject to amplification and revision, appears below:

"Some Observations on the Medical Uses of the Constant Current," Daniel Roberts Brower, Chicago, Ill.

"The Therapeutic Application of the Continuous Current," Truman Abel Pease, Norwood, N. Y.

"Exhibition of a New Current Controller and Discussion of the Methods of Therapeutic Control of Street Main Currents," George Betton Massey, Philadelphia, Pa.

"The Cataphoric Treatment of Cancer," Amedée Granger, New Orleans, La.

"Clinical Reports of Some Interesting Cases Treated by Electricity," Samuel Fairweather Wilson, Montreal, Can.

"Clinical and Experimental Effects of Electrical Currents of High Potential and Frequency," John Holcombe Burch, Baldwinsville, N. Y.

"Therapeutic Action of High Frequency Currents," Walter Henry White, Boston, Mass.

"Electro-Therapy of the Psychic and Sympathetic Neurone Centers," Charles H. Hughes, St. Louis, Mo.

"The Physiotherapy of Neurasthenia," T. Riviere, Paris, France.

"The Value of the Roentgen Ray in the Diagnosis of Fractures," Mihran Krikor Kassabian, Philadelphia, Pa.

"Diagnosis of Calculi," Russell Herbert Boggs, Pittsburg, Pa.

"Further Researches in the Treatment of Tuberculosis," Jefferson Demetrius Gibson, Denver, Col.

"A Case of Hyperidrosis of the Axillæ Cured by the X-Ray," George H. Stover, Denver, Col.

"Violet Light Baths; Their Physiological and Therapeutic Effects," Ernest Albert Weil, Paris, France.

"The Use of the Ultra-Violet Light in Therapeutics," Albert Eugene Stern, Indianapolis, Ind.

"Locomotor Ataxia Successfully Treated with Ultra-Violet Rays," Joseph Monroe Liebermann, New York, N. Y.

"Some Aspects of Phototherapy," Charles Rea Dickson, Toronto, Canada.

"Photo-Therapy in Chronic Diseases," John Harvey Kellogg, Battle Creek, Mich.

"The Importance of Associating Other Physical Measures with Electricity in Therapeutics," William Benham Snow, New York, N. Y.

The members of the Committee of Arrangements are C. H. Hughes, M. D., *Chairman*; A. V. L. Brokaw, M. D.; John Young Brown, M. D.; C. D. Chaddock, M. D.; Pinckney French, M. D.; Mark Ray Hughes, M. D.; B. M. Hypes, M. D.; L. H. Laidley, M. D.; and W. G. Moore, M. D., all of St. Louis. These gentlemen have arranged social features and amusements for the ladies who will accompany members, which will appear in the completed programmes which will be distributed at St. Louis. Any further information can be obtained by writing to the Secretary or the Chairman of the Committee on Arrangements.

Clarence Edward Skinner, M. D., L.I. D.,

Secretary.

PROGRAMME OF THE FIFTH ANNUAL MEETING
OF THE AMERICAN ROENTGEN RAY SOCIETY,
TO BE HELD AT ST. LOUIS, MO.

1. President's Address, by James B. Bullitt, M. D., Louisville, Ky.

TUBERCULOSIS.

2. "The X-Ray in Tuberculosis and Malignant Diseases," J. D. Gibson, M. D., Denver, Col.
3. "The X-Ray in the Treatment of Pulmonary Tuberculosis," Emil Grubbe, M. D., Chicago, Ill.
4. "The Roentgen Ray in the Treatment of Tuberculosis," J. Rudis-Jicinsky, M. D., Cedar Rapids, Iowa.
5. "The X-Ray in Tubercular Adenitis," May Cushman Rice, M. D., Chicago, Ill.

MALIGNANT DISEASE.

6. "Carcinoma of the Breast," by Charles Leonard, M. D., Philadelphia.
7. "The Treatment of Epithelioma," G. G. Johnston, M. D., Pittsburg, Pa.
8. "Variations in Radiotherapeutic Technique," Russell H. Boggs, M. D., Pittsburg, Pa.
9. "Radiotherapeutic Nihilism," Gordon G. Burdick, M. D., Chicago, Ill.
10. "The Results of Treatment of Carcinoma by the X-Ray," J. N. Scott, M. D., Kansas City, Mo.
11. "X-Ray Treatment of Sarcoma," F. J. Smith, M. D., Chicago, Ill.
12. "Two Blunders and Their Lessons," W. W. Johnson, M. D., Rochester, N. Y.

RADIOGRAPHY.

15. "An Improved Wehnelt Interrupter," Henry Hulst, M. D., Grand Rapids, Mich.
16. "The X-Ray in Injuries Near the Wrist," Martin Wilbert, Philadelphia, Pa.
17. "The Value of Stereoscopic Skiagraphy with Practical Demonstrations of the Process and Technique," Mihran Kassabian, M. D., Philadelphia, Pa.
18. "The Static Machine and Radiograph," John Pitkin, M. D., Buffalo, N. Y.
19. "Diagnosis of Brain Tumors and Softening," George Pfhaler, M. D., Philadelphia, Pa.
20. "The Interpretation of Chest Negatives," P. M. Hickey, M. D., Detroit, Mich.
21. A Paper by Weston A. Price, D. D. S., Cleveland, O.
22. A Paper by Levitt E. Custer, D. D. S., Dayton, O.

Progress in Physical Therapeutics.

LARYNGOLOGY, RHINOLOGY, AND OTOLOGY.

EDITED BY W. SCHEPPEGRELL, A. M., M. D.

Intratracheal Injections; Experimental and Clinical Studies Their Value in Diseases of the Lungs.

The value of intratracheal injections has been brought forward from time to time, and it is probably due to the difficulty of the technique that it has not been more generally adopted. Dr. Willis S. Anderson (Jour. Mich. State Med. Society) reports the result of his experiences, which are interesting.

The injection is made during an inspiration. In some patients it is easier to make the injection while the larynx is in a passive position, as a deep inspiration seems to increase the liability to coughing and gagging. The second method is the direct method. The patient is seated with the face toward the window and the head raised. The tongue is held by the operator. If the epiglottis can be seen, it is easy to introduce the cannula into the larynx. In those cases where the epiglottis cannot be seen it is much more difficult. Either method can be acquired by a little practice, and as one becomes experienced in giving the injections less irritation will result. In a few cases where the larynx is small and the glottic opening narrow some difficulty may be experienced, and also in those where the mucous membrane is hypersensitive. Experience in the use of the injection will insure success in almost all of the cases.

The best vehicle for the injection is olive oil. This opinion is based both upon clinical and experimental evidence. Colin Campbell of England uses Price's glycerin as a vehicle. Glycerin is irritating to all mucous membrane. Anderson's experiments upon animals, and a limited experience with it upon patients, have convinced him that it is not the vehicle to use unless for some special reason, as, for instance, its sedative power. The objections urged to olive oil, that it is not absorbed, that it coats the mucous membrane and prevents absorption of oxygen are not borne out by my experiments on animals, nor by a large clinical experience on patients. The advantages are, that it is solvent for most of the drugs one would naturally use; such as the essential oils, iodine, eucalyptol, guaiacol, menthol, and many others; that the drugs dissolved in oil become less irritating than when water is used, and that absorption of the oils adds so much nutriment to the body.

Intratracheal injections have a wide range of usefulness in diseases of the lungs and bronchi. Their action is both local and systemic. By their local action cough and irritation are quickly relieved. In spasmodic asthma the dyspnoea and whistling rales are lessened within a few minutes, and breathing becomes free and easy. This action is so quick that it is evidently due to the local action on the nerve terminals. Expectoration is facilitated by the action of the oil. In many cases the amount of expectoration is increased for the first few treatments, then a noticeable diminution follows. The relief of the dyspnoea is often immediate, due to the local action of the injection. The sensations following the injections vary with the condition of the lungs and the sensibility of the patient and the drugs employed. The patients usually described a slight smarting, burning, or cooling sensation. This seldom lasts more than one minute, and is never severe. As a rule, the local sensation is in proportion to the congestion of the parts, and decreases as the condition improves. The patient usually feels the effect more in the portions of the lungs affected. The injection is influenced by gravity as well as the suction force during an inspiration. The influence of gravity can be utilized in directing the injection into one or other of the bronchi, by inclining the patient's body laterally. Patients often smell or taste the drugs in the expired air many hours after the injection. As long as any of the injection remains in the bronchi or pulmonary vesicles, the air will contain the drugs: thus we have the effect of inhalation prolonged over a much longer period than when used in the usual manner.

The selection of drugs to be used is important. They must be non-irritating, freely soluble in the vehicle, and not used in poisonous doses. The writer has found that such drugs as guaiacol, camphor, menthol, iodoform, iodine, and some of the essential oils are most useful.

Aprosexia in Relation to the Ear, Nose, and Throat—Especially in Child Growth.

Aprosexia is a mental disturbance consisting in inability to fix attention upon any subject; an inability to think clearly and to comprehend readily what is read and heard; a condition sometimes observed in the course of chronic catarrh of the nose and pharynx (Gould's Dictionary). In referring to this subject Derrick T. Vail (Cincinnati Clinic, February 28, 1903) calls attention to the fact that aprosexia, impaired mental vitality, and even stupidity as exhibited by children and drones, may be, and too often is, the result of some eye, ear, nose, or throat defect which can oftentimes be easily remedied. We should not wait for nature to "outgrow" the defect or disease, for the child's character is forming and his whole future depends upon what he has learned and retained as a child.

The results of proper treatment are more than good—they are brilliant; and all the anxiety incident to putting the child on the operating table and using the dreaded chloroform or the nuisance of resorting to spectacles is repaid tenfold—nay, a hundredfold—by the great satisfaction of seeing a stupid, sleepy child transformed into a bright-minded, wide-awake, thinking machine.

CURRENTS OF HIGH FREQUENCY AND HIGH POTENTIAL.

EDITED BY WALTER H. WHITE, M. D.

Costal Tuberculosis Treated by High-Frequency Breeze. By M. Billinkin.

Two cases of costal tuberculosis were treated by the high-frequency breeze with monopolar which is strong with prickling sensation for fifteen to twenty minutes every other day. The constitutional effects disappeared in a short time and the abscesses healed quickly, absence of pain in flexion and extension of the vertebræ. He has made forty to fifty treatments to get the good effects. The patients are obliged to repose on account of their fatigue.—Bulletin Officiel de la Société Française d'Electrothérapie, March, 1904.

The High-Frequency Current with Glass Vacuum Electrode, as Adjunct to the X-Ray. By May Cushman Rice, M. D.

The author cites 13 cases, 5 of them being epithelioma, 1 rodent ulcer, 1 lupus. One interesting case of cystic ovaries which were found to be so when an operation for appendicitis was performed. These were not removed, as patient did not take the anæsthetic well, and have been much reduced in size, so that the patient has resumed her work.

The cases were cured after receiving treatment by X-ray in most of the cases. Vacuum tubes were used, being excited by a large static machine.—Archives of Electrology and Radiology, June, 1904.

Sulphuric Acid as a Drying Agent. By John W. Coolidge, M. D., Scranton, Pa.

In his story of "Fifty Fathoms Down" Mr. Morgan Robertson deals with the fanciful to a degree that the really scientific facts are apt to be overlooked by the casual reader of this charming story. However, he shows the workings of the trained intellect in his close and careful analysis of abstract but well-demonstrated formulæ of his former college days in the

chemical laboratory, deducing therefrom a practical working result, which led to the rescue of a sunken submarine torpedo diver after many days of groping, submerged on the sea-bottom.

Every owner of a static machine who reads the narrative will have a hint given him, if he reads with his mind open as well as his eyes, which should place him under eternal obligations to the clever raconteur.

Alone in his boat, fifty fathoms down, after his water-logged motor battery had been lifted from the water by the shifting of the keel and the storage battery was cleared from all contact with water, he must sit down and wait for the insulation to dry. In the sealed-up hull, the atmosphere was saturated with moisture (as in a static) and no evaporation could take place. It was many days before the thought came to him—a drying agent for gases—sulphuric acid.

With the abundance of the material at hand the problem was soon solved.

No other chemical substance has such an affinity for moisture. And to the man who hitherto has used the calcium chloride and undertaken to bake it out whenever saturated, the substitution of a simple glass vessel containing a few pounds of commercial sulphuric acid will be an expedient most welcome and valuable.

I am not under obligations to the clever writer of fiction for the use of the acid as a drying agent, which I have now employed about two years, and I have never seen its use suggested in medical print, but I do recall various inquiries made in print and in discussion of the care of the static, and a very pertinent editorial in your valuable columns, since I began using the acid, as to how to overcome the free chlorine action on the metal of the machine. Anyone who substitutes the sulphuric acid will find, I am sure, what a perfect drying agent this is.

Three or four pounds, costing only a few cents, will keep the machine dry for months, and the change in color from a light to a reddish fluid will tell one when it is oxidized and needs to be renewed. And, besides, he will not have the annoyance, as I have in past years, of a run-down machine at important times and the delay in baking out or sending for new material with the machine several days out of use.

RADIOTHERAPY.

EDITED BY J. D. GIBSON, M. D.

Epithelioma Cured by X-Ray. By T. P. Corbally, A. M., M. D., *Le Progrès Médical*, January 23, 1904.

When the patient was examined the first time by the author

of the communication he had the whole of the left wing of the nose destroyed by the tumor. The sore measured 3.5 c. in height and 2.5 c. in breadth. The examination after bioscopy confirmed the diagnosis as localized epithelioma.

The treatment employed was radiotherapy.

The result has been as follows: At the end of two weeks the falling away of the crusts, the arrest of the hemorrhages; at the end of the first month the pain disappeared, and at the end of the second month the cicatrization was complete.

Action of Roentgen Rays on Animal Tissues.

MM. R. Lepine and Boulud have, at the Académie des Sciences found that fragments of the pancreas of a dog exposed to the Roentgen Rays manifested a power of reduction much stronger than similar fragments left shaded from the rays. The difference exceeded in one case 25 per cent.; the average in five tests was 12 per cent.

Exposed to the rays less than an hour the pulp of the dog's liver holds almost always less glycogen and more sugar than is found in the pulp, and the sum of the glycogen and the sugar is less. The first effect of the X-rays is to favor the glycogenic and the hepatic glycolysis. But when the exposure is prolonged for more than an hour the conditions are reversed.

The conditions hold the same for the blood, in which case the glycogen and the glucose at first are favored by the Roentgen rays, while the radiologic action is less prolonged, diminishes, and may, perhaps, arrest both.

X-Ray Therapeutics. G. H. Stover, M. D., New York and Philadelphia Medical Journal, July 2, 1904.

This paper by Dr. Stover is a very valuable contribution to the present literature on the subject of radiotherapy, and it is a paper well worth the perusal of anyone interested in this line of work. He goes well into detail in the report of all his cases, which makes his report the more valuable.

He reports in all 30 cases of cancer and lupus; of these 16 cases were successful, 7 were failures, and 7 were doubtful, under treatment or lost sight of.

Eleven tuberculosis cases of varied conditions were reported. Of these cases 1 died, 4 cases did not improve, and 6 cases recovered.

Of 5 cases of Hodgkin's disease, 1 died and 4 improved.

Four cases of acne were reported: 2 improved and 2 were cured.

In lupus he uses both light and X-rays, and discovers no advantage of one over the other. He considers the X-ray almost a specific for epithelioma, but not so certain with carci-

noma or sarcoma. He thinks that much will yet be accomplished in the treatment of deep-seated conditions. He considers the X-ray of great use in the treatment of all tubercular conditions unless it be of the lungs, and in these he has obtained some benefit, but less than in other tubercular conditions.

Roentgen Ray Treatment of Leukemia, Myelogenous Type.
Drs. L. C. Grosh and W. J. Stone, Jour. A. M. A., July 2, 1904.

They report a very interesting case, although not successful as far as saving the life of the patient is concerned, but still it shows what can be done with X-ray in these conditions. They go into minute details in the examinations of the blood and urine which I will not attempt to give here, but will give only the final conclusions. At the commencement of treatment the leucocyte count showed 266,250 and after twenty treatments by X-ray it was reduced to 10,600, or from 52 per cent. to 2 per cent.; this with a large increase of the red corpuscles and the hemoglobin.

Roentgen Rays in the Treatment of Cancerous and Skin Affections, and Epilepsy, and Diagnosis. Herman Brant, M. D., New York and Philadelphia Medical Journal, June 11, 1904.

"Roentgen Rays as a Remedy in Epilepsy." I consider this part of the paper so important I will quote it in full or very liberally: "Of course all cases are not amenable to this form of treatment, for instance, those where decided degeneration processes of the brain have set in. The starting point of the convulsion is primarily in the cortex of the brain, and secondarily in the medulla oblongata.

"In many cases the existence of the epileptic seizure depends on the instability of the cellular brain elements, or on abnormal metabolism. It is accepted by many authorities that X-rays stimulate protoplasm into greater vital activity. Upon this theory are X-rays applied to this condition. Three treatments a week are given and fifteen inches exposure. A different part of the skull is exposed at each sitting. A hard tube is used, and the hair may drop out, but it is most likely to be replaced by a heavier suit; some will not drop out at all. As a rule, the patients gain in weight very rapidly; most of those treated have averaged about two pounds a week.

One case, a boy about fourteen years of age, gained nine pounds in four weeks, and now is a rollicking boy and very bright. Before the treatment was instituted the spasm (grand mal) became more and more frequent; his memory was very faulty, so that his school lessons suffered; his companions were unpleasant to him, owing to his seizures. He took bromides, but in spite of them the intervals grew shorter and shorter. I

stopped the bromides and applied X-ray treatment to the head and the static brush discharge to the head. His temperament now is amiable and his memory is good; he was formerly irritable and cross. He now is struggling for the first position in his class with good prospects of success, to the wonderment of his teacher and parents. He has had no spasm since November 7th, and his treatment commenced on November 8th."

Several other cases are reported, all with good success.

Röntgen Ray in the Treatment of Leucæmia. By W. Jordan Taylor, M. D., the Cincinnati Lancet-Clinic, May 14, 1904.

The writer calls attention to seven cases recently treated and reported by N. Senn and others of pseudo-leucæmia and splenomedullary leucæmia which seem to have been cured by means of X-ray, after all other means have failed.

The doctor gives a nicely detailed account of the progress of his own case, in which, unfortunately, after apparently a complete recovery had taken place, the patient was seized with a violent pain in the head and died, probably from meningitis.

Probably the latest method in treating these cases is with artificial fluorescence of the tissues, as advocated by Morton, employing quinine or fluorocene and raying the whole body as well as the spleen.

RADIOGRAPHY.

EDITED BY HERMAN GRAD, M. D.

Developers. By Dr. Gordon G. Burdick, M. D., Archives of Electrolgy and Radiology, May, 1904.

The writer states that "after trying nearly everything in this line of reagents, I have decided that a mixture of ortol and metol gives the best all-around negative for skiagraphy. I use it in the following combination:

(A)

" Ortol.....	15.
Metol	15.
Meta bi-sulphite of potassium.....	.75
Bromide of potassium.....	1.
Aquæ dist.....	1000.

(B)

Aquæ dist.....	1000.
Sodii sulphite C. P. dry.....	40.
Sodium carbonate, dry C. P.....	60.

" Use 30 c. c. of each and dilute with from 30 to 120 c. c. of water, according to the effects desired. The less water the more contrast, while by diluting the reagent more the softer the negative will be and the more detail will be seen.

"The ortol is used because it imparts a brown color, which gives the greatest possible contrast and shows no disposition to fog or veil, no matter how long a plate is left in the solution.

"Metol is used because it brings into the negative a wealth of detail, and in the strength here recommended shows no disposition to fog a plate.

"Sodium sulphite C. P. dry is used in the solution simply to impart a black stain to the silver molecule, as negatives developed without this reagent show the characteristic aniline stain from each agent used; but by using sodium sulphite we obtain a brown-black deposit of very fine grain, giving good printing density.

"Sodium sulphite is one of the most delicate salts used in photographic chemistry; if exposed to the air for a few minutes it is oxidized to sodium sulphate, and a few grains of sodium sulphate will reduce bromide silver not polarized by light to metallic silver, causing a veil or fog to cover the plate. This salt should always be purchased from a reliable maker in original bottles, and if possible the entire contents used when it is opened.

"Meta bi-sulphite of potassium is used only to preserve the developer and prevent the action of the oxygen of the air upon the solution.

"Sodium carbonate is not required in a developing solution, and is usually harmful, as its function is to save time only, by rendering the gelatine soft or soluble, according to the amount used. If the carbonate is used in too great a strength, we will note a loss of sharpness to our lines; they are no longer clear and distinct. The gelatine, having become so soft, has changed its position upon the plate and relation is lost."

He also states that "Developers should not be exposed to the air while not in use, or a slow and gradual decomposition will take place which is told by the brownish color of the solution."

HYDROTHERAPY.

EDITED BY CURRAN POPE, M. D.

Reciprocal Relations between Skin and Kidney Activity. By E. Bendix.

Bendix epitomizes the results of considerable experimental research under Ebstein's direction in the statement that he found it impossible to influence the normal freezing point of the blood by even the most energetic sweating procedures. He was unable to induce a thickening of the blood by withdrawal

of water, nor, by the elimination through the sweat of substances dissolved in it, to reduce the molecular concentration of the blood. This applies to both the normal animals and those with kidney affections. In the clinic he conducted similar research on patients who had to be treated by diaphoresis and venesection at the same time—mostly cases of kidney disease. The sweating was induced with the Quincke-Dubois hot-air apparatus, and the weight of the subjects diminished by 500 to 1500 gm. under it. The sweat was accumulated on a rubber sheet. The results harmonized with those obtained with the animals. When the freezing point was normal— 56° C.—the most energetic sweating procedures had no influence on it. On the other hand, when the freezing point of the blood was pathologically low, as in chronic nephritis, the sweats raised the freezing point almost to the normal standard. This result is the more remarkable as the sweat is usually hypotonic in regard to the blood, and the result naturally to be expected would be a thickening instead of a dilution. The findings suggest the probability that the body must always have abundant reserve supplies of water on hand somewhere, which serve at need to wash out the solid substances. He found that more solid substances were eliminated in the sweat under these circumstances than when the freezing point remained at a constant level. This was particularly noticeable in a case of acute uræmia. He does not attribute much importance to the variations in the freezing point of the sweat, but these experiences emphasize the value of energetic sweating procedures in case of insufficiency of the kidneys—manifested in a pathologically lower freezing point of the blood—as a means of restoring the freezing point of the blood approximately to normal. The character of the kidney trouble does not seem to affect this result. He has also derived the impression from these researches—although unable to scientifically prove it—that ingested iodine is also eliminated in the sweat, subject to individual variations, both in normal and nephritic subjects.—*Jour. A. M. A.*

Hydriatic Treatment of Pulmonary Tuberculosis.

B. Buxbaum recommends that tuberculous individuals, immediately after leaving bed in the morning, should be given cold rubs or baths to a part of their body with water at 50° to 55° F. Patients with fever, confined to their beds, should have moist bandages applied to the chest and back, and these bandages covered with dry ones. During the forenoon cold applications should be made to the heart for one-half to one hour. Patients not confined to bed should lie down for a part of every morning for the purpose of cold-water treatment to the heart. This should be repeated in the afternoon, and followed by

fifteen-minute douche of water of the same temperature as that used early in the day. Before going to bed the morning ablution is repeated and followed by application of cold bandages to chest and back. There must be individualization in hydrotherapy as well as in drug therapy. This method, useful for many, is harmful for some.—*Am. Med.*, 1904.

Psychiatric Therapy. By P. Prengowsky, *Allgemeine Zeitschrift fuer Psychiatrie*, Vol. 60, 1903, No. 3.

The author calls attention to the skin as an organ of elimination and thinks that a failure of this organ to perform its function may be at the bottom of some psychoses of possibly toxic origin. In a case diagnosed as "periodical neurasthenia" he claims to have been able, by the local applications of cold, to produce an array of symptoms affecting the skin, the circulatory organs, and sometimes the digestive apparatus, with mental manifestations corresponding closely to those of katonis, all of which could be made to disappear, by warming up the skin again. From clinical study, and from the above experimental evidence, he urges the advisability of avoiding drugs which tend to produce arterial spasm, caffeine especially. The symptoms described he attributes to the production of arterial spasm, the consequent suppression of transpiration through the skin, and urges the rationality of encouraging sweating, and especially the use of the prolonged warm bath as recommended by Kraejelin and others.—*Jour. Am. Med. Assn.*

Some Personal Observations and Experience of the Schott Treatment of Heart Diseases. By William W. Baldwin, *Medical Record*, New York, February 13.

Baldwin described this method and its advantages, noticing also the contraindications, which are advanced arteriosclerosis, advanced chronic Bright's disease, aneurism of one of the larger arterial trunks, cases of bronchial asthma and chronic bronchitis, all of which indicate a milder and slower course of treatment. While he has never employed this treatment in cases of heart disease complicated by tuberculosis, Bezly Thorne has often employed it thus to advantage. In every grave case of organic heart disease, where muscle degeneration is far advanced, other remedies should, at least, be tried first. In cases of great anæmia and emaciation in which the effervescent baths are not well borne, carefully regulated, mild brine baths have an excellent curative effect. As a general rule, in all the grave cases where the stronger stimulating baths cause palpitation, asthmatic symptoms and cardiac weakening, irregularity of pulse, cyanosis, and other unfavorable symptoms, we should return to the mild brine baths for a time. Some patients

have too tender skins for any effervescent baths, and, of course, they are contraindicated. He thinks the artificial Nauheim baths are valuable, but, if possible, he sends his patients for an additional course at Nauheim. The Schott resistance exercises are also described; he thinks every physician should learn to practice them. They can be given before the baths can be safely employed, and, in his judgment, can be continued indefinitely, can be employed to suit almost any indication of general strength or debility, and the patients can teach themselves. They are admirable respiratory exercises, exert a tonic influence on the heart muscle, and must eventually prove of great therapeutic value. Long-continued effervescent baths at first are a mistake. Any half-hearted, pottering method of treatment is also condemned. Extreme care and prudence are necessary in these cases. One should always employ a trained nurse to assist in giving the baths, even when the physician is present. Jour. A. M. A., February 27, 1904.

PSYCHO-THERAPY.

EDITED BY LESLIE MEACHAM, M. D.

Dr. Albert C. Buckley, the eminent neurologist of Philadelphia, in a recent number of the *Medico-Chirurgical Journal*, urges physicians to make use of every opportunity to oppose and correct the fallacious tendency on the part of the public to associate hypnotism with mysticism and occult power. He will discourage the public performances for gain and regulate its use as a therapeutic agent. In his explanation of the phenomena he follows the conclusions of Braid that hypnosis is subjectively induced and that it is the result of concentration of attention. "The effort on the part of the individual is necessary to bring about the condition, and therefore it is self-induced. During the time when some of the mental processes are in abeyance others remain active or may even be increased at the suggestion of the operator, which increase varies in degree in different individuals and under different circumstances in the same individual." Two psychological conditions are considered: "The state of consciousness, a condition resulting from a series of intricate mental processes the effects of which are always referred to self or I—the 'ego' of the psychologist." "Secondly, there is a state in which most of the mental facul-

tics may be in abeyance and other mental processes remain intact. This is the subconscious state, a very frequently occurring condition, which we have to bear in mind when intelligently discussing hypnotism and which is best illustrated by the ordinary dream state."

Thirdly, he considers equally important in consideration concentration of attention as essential to the induction of hypnosis, which may be considered to a great extent self-induced, due to the fixed attention of the subject and absolute relaxation and attention to the requests of the operator. Weak, long-continued, uniform stimuli to the nerves of special sense contribute to the securing of the results. Similar phenomena are seen when the mother soothes and puts her child to sleep with a lullaby, or when persons are exalted or carried away by the words of an eloquent speaker. Hypnotism is not mysterious, but is an exaggeration of a normal condition. Therefore, the essential conditions of hypnosis do not lie in the operator but in the subject. Not many can be hypnotized at the first attempt; the more frequently that it is accomplished, the easier it is done.

He offers the following summary of views:

"1. The early ideas of hypnotism were based on an erroneous doctrine. 2. The phenomena are governed by natural law. 3. There is nothing mysterious except to the unintelligent. 4. It is a partial suspension of consciousness. 5. The condition seems to simulate the sleep of some persons—best illustrated in sleep-walking. 6. The coöperation of the subject is necessary for the induction of hypnosis. 7. Ill effects have been known to follow the practice of hypnotism. 8. It should not be practiced for amusement or gain. 9. The best way to govern the practice of hypnotism would be by law."

While the conclusions of the writer are, on the whole, correct, he omits to take the point that, as suggestion is now scientifically employed as a therapeutic agent, none of the objections made apply. Sleep and even a deep state of drowsiness are not necessary, and there is in no way a surrender of individuality. Again, while the coöperation of the subject is usually necessary, there are many exceptions to the rule, even upon the first trial.—L. M.

Dr. J. R. Etter of Crawfordsville, Ind., in the Wisconsin Medical Recorder, maintains the proposition that "Any phy-

sician who is unwilling to investigate the subject of hypnotic suggestion is unworthy of the name." "Suggestion is the most potent remedy that the physician can use, and while many decry it when speaking of it as an entity, there is not a physician who practices medicine who does not in some way use suggestion." The physician's bearing of confidence when he enters the sick-room has much to do with his success in the particular case, as well as in his general success." "It is this confidence that one human being inspires in another that moves the world, and achieves all our victories in war and peace." "It is not always necessary to procure somnambulism to get good results from suggestion. If a patient comes to you in confidence that you are able to help him, and you firmly impress him that you can, he is sure to be benefited by your suggestions." "Hypnotism is not a cure-all, in fact, it is not a remedy *per se*, but puts the patient into a receptive state for suggestion, and it is the suggestion that cures."

Boris Sidis Morton Prince and H. Linenthal report an exceedingly interesting and well-worked-out case of hysteria following psychic shock, in the Boston Medical and Surgical Journal for June 23. A Russian Jew boy of sixteen was so frightened as to fall and lose consciousness, this being followed by a right hemiplegia with anæsthesia and spasms which lasted several days after he became conscious. The arm and leg were weak for a few days longer, when he became as well as ever, but each year, about the time of the original attack, he has suffered a similar one, though he does not become unconscious. After five years of these experiences he came under the care of the authors, who made careful experiments with him. It was found that with the anæsthetic hand so placed that he could not see it, and his gaze fixed upon a glass of water, although he did not feel the touch, if his hand was touched five times he would see the figure five written large and on the back of a hand. Similarly, pin-pricks were felt and perceived as visual hallucinations in spite of the profound anæsthesia. When he was hypnotized the anæsthesia persisted, but when made to believe that he was a boy of fifteen, before the fright, the past five years had been blotted out from his consciousness, he was back in his old home in Russia, unable to understand English, and sensation was wholly normal; every trace of the anæsthesia had vanished. Then, on being told that he was older and that the fright had occurred, sensation was again lost and the hand again became anæsthetic.

The authors believe that this case confirms the opinions of other observers that hysterical anæsthesia is not a true anæsthesia, but due to a dissociation of consciousness probably corresponding to a functional dissociation of cortical neurons;

that the hysterical frame of mind consists in a dissociated condition of the conscious and subconscious mind. "The pathology of such cases as this, and of hysteria in general, consists on the one hand, in the dissociation of the mental and cerebral processes, and, on the other hand, in the independent and automatic activity of the disaggregated psychic (and cerebral) states. Dissociation and automatism are the two fundamental processes."

[This will apply equally to the state of somnambulism in hypnosis.—EDITOR.]

The New York Medical Record recently gives in its editorial notes experiences of Dr. Milne Bramwell of London, Dr. Creed of Sydney, N. S. W., and Charles Lloyd Tuckey of London in the treatment of alcoholic patients. Bramwell reports 28 cured and 36 benefited out of 76 cases treated. Creed urges the use of suggestion in both public and private institutions; while Tuckey reaches the following conclusions: (1) Most alcoholics are good hypnotic subjects. (2) To insure a reasonable prospect of success the patient should have a real wish to be cured, and should be placed under favorable influences while undergoing treatment. (3) He should be kept under observation at least a year, during which he should feel that he is on probation.

He states that the advantages are these: (1) It is rapid in action. After two or three sittings there is generally a marked improvement in the patient's mental and moral condition. (2) The patient is enabled to continue his business, and is thus saved the expense and loss incurred by confinement in a retreat. Domestic ties are not broken, and the demoralization which often results from the enforced idleness and evil companionship, almost inseparable from life in a retreat, is avoided.

Suggestion should aim at two objects—absence of craving and even physical repulsion toward alcohol, and increase in power of resistance and restoration of self-control.

[Great care should be observed in making a prognosis in case of the so-called cases of dipsomania. They may be very easily hypnotized, but therapeutic results are very unsatisfactory.—L. M.]

NEW AND IMPROVED APPARATUS.

This department is devoted to publishing, with illustrations, drawings, and descriptions, new apparatus, electrodes, etc., for the benefit of those interested in the progressive improvements in armementaria.

**A MACHINE FOR PRODUCING A NEW OXIDIZING
AND ANTISEPTIC AGENT FOR INHALATION
PURPOSES.**

Electrotherapeutists long ago recognized the highly oxidizing and antiseptic powers of ozonized air, but, owing to its



irritating effects upon the lining membranes of the respiratory passages, when used as an inhalant, it has not been very satisfactory as a therapeutic agent.

There have been many drawbacks to this method of treating disease. Aside from the difficulties of making it in sufficient quantities to be of any medicinal value, the unavoidable con-

tamination with chemical impurities of an irritating character have been very objectionable.

No matter by what means air may be ozonized the oxygen and nitrogen are more or less permanently united and the result is that nitric-acid gas is more or less present in the ozonized air. It is true that the quantity of nitric acid depends largely upon the kind of electric spark used in the operation. The less violent the spark the less nitric acid is created.

The object of the inventor of this machine has been to make an ozonizer that would create a great amount of ozone with the least amount of electric action upon the nitrogen of the air; then to use the ozone for producing a new chemical product.

The method of ozonizing the oxygen of the air consists in passing air over electrodes, charged with a high-potential current, giving off a silent discharge in considerable volume. The electrodes are so arranged as to admit of little or no oxygen passing unconverted, while the nitrogen, which is loosely united with the oxygen, passes through the ozonizer with the least possible change.

The process of the new compound takes place as the ozonized air passes out through a crescent-shaped tube partially filled with hydrocarbon oils of the turpine group, and is delivered to the patient through a flexible extension tube and closely-fitting face mask.

In this process the hydrocarbon oils are driven off at ordinary room temperature by oxidation, and the resultant gas is a pleasant inhalant, the medical properties of which is a peroxide compound of pinine, cymine, camphine, and eucalyptol, wherein the identity of the ozone is lost as to its pungency, odor, and chemical reaction.

Inasmuch as the uses to which this machine is applied in the treatment of disease are not yet generally known, a description of the machine would not be complete without at least outlining some of the physiological actions of the product when used clinically.

In the new compound none of the oxidizing or antiseptic powers of the ozonized air are lost. In fact, these properties are increased to a marked degree, which have been verified clinically and upon germ cultures.

The advantages of medicating the blood, as it comes to the

lungs to receive oxygen with a highly oxidizing and antiseptic agent, are obvious.

The influence upon the vasomotor system through its oxidizing properties, and its effect upon pathogenic bacteria in the blood current, are features worthy of consideration.

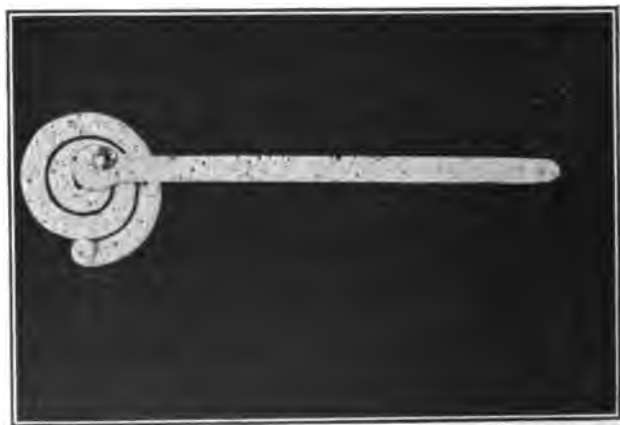
An examination of blood taken from the skin after treatment shows a high percentage of increase of red corpuscles and hemoglobin which, at least, demonstrates its action upon the peripheral blood vessels and coloring matter of the blood.

Its action upon the vasomotor system is shown in the more active performance of the functions of all the organs, in the way of increased appetite, relief of constipation, headache, and insomnia, etc.

The particular forms of diseases in which the method is found most applicable are infectious and nervous diseases, such as syphilis, pneumonia, tetanus, bronchitis, neurasthenia, melancholia, and early stages of tuberculosis.

Manufactured by the Neel, Armstrong Co., Chicago, Ill.

A NEW VACUUM ELECTRODE.



A new vacuum electrode for making applications to the surface of the body, for use with coils or static machines, manufactured by E. Machlett & Son, New York.

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CHRONIC ULCERS CURED BY METALLIC ELECTROLYSIS AFTER THE X-RAY AND HIGH-FREQUENCY CURRENTS HAD FAILED.

BY FRANCIS B. BISHOP, M. D., WASHINGTON, D. C.

The reputation obtained, and in a large measure sustained, by the X-ray in the treatment of chronic and malignant diseases, especially diseases of the skin and superficial fascia, has had a tendency rather to deflect the mind of the observer and operator from other fields equally as potent, and in many cases superior.

If every case of chronic ulcer treated by the intelligent application of the X-ray, or the high-frequency current, could be said to have been cured thereby, we would be in a position to say, at least, from past experience, we believe that we have in these agents a panacea for this form of disease, but unfortunately such is not the case.

The treatment of disease by any form of energy must have for its successful termination psychic and constitutional conditions *en rapport* with the operator and with the treatment.

There are many cases reported cured, or improved, by the X-ray, while but very few failures find their way to the pages of our journals. Everyone who has had any considerable experience in X-ray therapy must have met individuals who did not take kindly to, or did not respond to this treatment. The writer has seen cases apparently mild, which seemed to be aggravated by the X-ray and sometimes by the high-frequency currents, even when administered after the most approved method. That he has had a fair proportion of successes he does not attempt to deny, nor is this paper intended to decry the value of these very important additions to our therapy, but from his experience in one very chronic case treated by metallic electrolysis he wishes to emphasize the fact that we have not always done all within our power when the X-ray or high-

frequency current, for some cause unknown, fails to cure or even aggravates the case. As idiosyncrasy plays a very important part in drug therapy, which we note in the extreme susceptibility of some patients to morphine, quinine, iodide of potassium, ipecac, and other drugs; and in these cases often the alkaloid cannot be tolerated, while the crude drug may be taken with ease and benefit, so, in electricity, individual peculiarity must be taken into consideration, and psychic as well as physical conditions should not be neglected in the treatment of chronic and malignant diseases any more than they are in functional nervous diseases. The bearing of the physician, the manner in which he makes his examination and prepares the patient, and his apparatus for the treatment, are all carefully watched and noted by the patient who, of course, is the most interested party to the compact. A favorable impression at this time will often place us upon the road to success, while the contrary may turn the tide against both physician and patient. It is well, in the writer's opinion, to let the patient feel that we have not reached the limit of our resources, so that the element of hope may always be with us to assist us at a time that we are sorely in need of an optimistic spirit in our patient.

The time will probably come when we will be able to note in our patients before treatment some peculiarity which will lead us to select one form of current in preference to another, but for the present, nothing but a trial can determine the question of idiosyncrasy, and this condition is undoubtedly destined to receive a fair proportion of respect. We cannot treat locally, by any current known, without influencing to a greater or less extent the entire nervous and vascular systems, therefore, if for some cause, a high-tension current is not kindly received, whether it be X-ray, high-frequency, or static, we are not apt to benefit our patients by a continuation of such methods. While the writer has noted, in many instances, special peculiarities for or against some form of current, he has yet to see a patient that could not take with ease, and often with great benefit, electricity in some form. Not infrequently a patient is subjected to several methods of treatment even by the same form of current, before a treatment is obtained that is attuned, or in harmony with the nervous mechanism of the patient. So in the treatment of local ulcerations of a malig-

nant character, the nervous endings in the skin yield their benign influence by bringing into play physiological processes, when treated by currents of low or high tension, according to the physiological harmony existing between the nerves and the current used, if at the same time the current carries with it into the tissues an agent more or less destructive to the organisms or cells of degeneration.

The high-frequency currents, as well as the X-ray, are forms of energy electrical that are said to have the power of destroying pathological cell life and micro-organisms, and in constitutions well adapted to this form of treatment will cure superficial malignant disease.

In metallic electrolysis we have another form of energy of low tension which yields, in many cases, results equally as favorable.

The following case was sent to my care through the kindness of Dr. J. R. Bromwell, of this city.

A lady sixty years of age, a decided blonde, fourteen years ago noticed a dry scaly appearance upon the side of the nose under the inner canthus of the left eye. This finally broke down, and at first produced apparently a simple ulceration of the epidermis, then the true skin, and finally the superficial fascia; the ulceration very gradually spreading until, at the time she came under my care, she was in great fear of her eye being invaded. The ulcer at that time was about the size of a silver twenty-five-cent piece, and exuded a thick, dirty pus that would form in a heavy scab. This would drop off, and leave the ulcer looking angry and dirty with well-defined hard edges. The ulcer was carefully cleansed with hot antiseptic solutions, and the X-ray applied for ten minutes every other day for ten treatments, when a decided reaction was produced, the skin showing marked redness around ulceration, but the ulceration itself seemed to spread more rapidly, the eye being swollen and closed all the time, except for a short while after cleansing the ulcer. The high frequency was now substituted and used daily for two weeks, then on alternate days, the X-ray being used every other day for two weeks more. By this time the ulcer had grown so much, and was threatening the destruction of the eye to such an extent, that I decided to stop with the X-ray and try a modified method of my friend Dr. Massey of Philadelphia.

for treatment, the disease has been arrested; they have been able to continue their employment, care for their families, and enjoy a good degree of comfort.

They have also acted as instructors to their families and neighbors; rehearsing to those about them the rules laid down for their guidance.

The results obtained have led to the following conclusions:

1. That tuberculosis, as a rule, is contracted only by those suffering from malnutrition.

2. That each case is *sui generis* and must be treated accordingly, therefore all idea of a specific remedy is utopian.

3. That the clinical division of the disease into stages is of no practical importance, the main question in prognosis being: has the patient vitality enough to respond to treatment?

4. That incipient cases, and those where the vitality has not become exhausted, will not only improve but get well.

5. That a very large proportion of those afflicted with this disease need not leave their homes or business. Treatment here in New York, properly applied, yields results equal to those obtained in other places.

6. Every form of treatment is of use, and when adapted to the case in hand, will (providing always that the patient has the vitality to respond) give good results.

7. That well-organized clinics with district nurses, who are trained in sanitary science and in the art of preparing food, will, in connection with the proper housing of the tenement-house population, do more to eradicate this disease than can be done in any other way.

8. That hospitals should be provided for those who have no homes, and for advanced cases which are likely to become centers of infection; but the large majority of tubercular subjects will do quite as well outside a hospital as in it, and, if proper hygienic rules are observed, there is practically no danger to be apprehended from them.

9. That the greatest cause of the spread of tuberculosis is malnutrition, due in great measure to the excessive indulgence of the appetites and passions, improper housing, improper alimentation, including indigestible and improperly prepared food eaten hurriedly and in excessive quantities; fermentation, with the production of toxins long continued, producing a condition of the system which invites infection by the tubercle bacilli.

10. That an optimistic attitude upon the part of the physician and a cheerful perseverance, even under discouragements, are necessary to success.

11. That the people should be taught how to live, including self-control. Physiology, hygiene, cooking, and dietetics should be taught in our public schools, and made compulsory for both boys and girls.

THE COMPLETE ABSORPTION OF A LARGE UTERINE FIBROID BY X-RAYS.

BY J. E. HETT, M. B., ONTARIO, CAN.

After observing the effects of the X-rays upon cancers and sarcomata, my curiosity was aroused as to whether the rays would also have an effect upon uterine fibroids, since these growths are to a great extent amenable to the continuous currents. Accordingly, I resolved to use the Roentgen rays on the following case:

Mrs. H——, Ottawa, age 45, consulted me on January 27, 1903. The history of the fibroid growth dated back twelve years. During that time there had been, in all, severe hemorrhages, which gradually became more severe. During the past six months she had suffered severely with pains and sensations due to pressure. The bladder irritation was very aggravating, and her general health had suffered very much by the associated disturbances.

Examination of the abdomen showed, on inspection, the outlines of the growth, which filled the whole lower abdomen, and extended above the umbilicus. The growth was of the intramural, multinodular type. The patient had consulted a number of surgeons, who advised operation, which she refused. She submitted, however, to the X-ray treatment with a thorough understanding beforehand that I had never treated a fibroid by X-rays before, and that I had never read any report of a case having been treated by that method.

The abdomen and chest were well protected with sheets of lead, and the opening for the rays was covered with celluloid. Vaseline was also applied freely to the abdomen for protection against a burn. Daily treatments were given through the abdominal walls until a slight dermatitis showed itself on the twenty-third day, and then a ten-days' interval was given, when the redness of the skin disappeared. Ten treatments more were then given, and the patient was advised to return home and await results.

A hard tube was used, excited by a 16-plate Wimshurst static machine, about 15 inches distant, and 15-minute exposures.

At the end of the treatments no diminution of the growth

was noticed; only a very slight browning of the skin. The hemorrhages, however, ceased, and there was less pain. After returning home a burn developed, and her physician, Dr. J. G. Smith, Hintonbury (a suburb of Ottawa, Ont.), was called in attendance, and he has kindly given his words for publication. He wrote: "One week after arriving home, March 13, 1903, I visited Mrs. H—— and found her suffering from a burn between umbilicus and pubes slightly larger than the size of a man's hand. She suffered intense pain. Tried all the remedies I could think of in my endeavor to relieve pain and bring about healing. In spite of everything used the pain continued constant, and the wound healed very slowly. When the wound was about 2 1-2 x 2 1-2 inches the healing stopped and the pain became unbearable. I advised thorough scraping of the wound. Under chloroform proposed to do this, but finding a thick sole-leather-like substance, concluded it better to excise the entire surface, which I did; cutting down to the healthy tissue. The substance removed was from 1-4 to 1-2 inch in thickness, very dense, and of an ash-brown color. The sharp, lancinating pains ceased immediately, the wound took on a healthy look, and slowly closed in. As regards the fibroid: The hemorrhage ceased, the pressure symptoms are gone, and the tumor mass has disappeared. At the present time, she enjoys splendid health, and says she was never better in her life. She certainly looks it."

During the treatment the urine was examined and found to be saturated with uric-acid crystals; and the question has arisen in my mind whether the uric-acid condition of the patient's system was responsible for the severe burn. Not having had any other bad burns, no opportunity has been open to study the uric-acid condition, as being responsible for the so-called "idiosyncrasy."

This case has clearly demonstrated to me that vaseline and celluloid are no safe protections, and that further experiments on uterine fibroids will demonstrate that these growths will disappear under X-ray therapy.

109 King Street, East.

RETROSPECT OF THE SECOND INTERNATIONAL
CONGRESS OF ELECTRO-THERAPEUTICS, HELD
IN BERNE (SWITZERLAND), SEPTEMBER 1 TO 6,
1902.*

BY ROBERT NEWMAN, M. D., NEW YORK.

The second International Congress of Electro-Therapeutics and Radiology was held in Berne (Switzerland), from September 1 to 6, 1902, at the same time as annual meeting of this Association at the Hotel Kaaterskill, N. Y.

The President of the Congress was P. Dubois, M. D., of Berne, and the Secretary General, L. Schnyder, also of Berne. All the preliminary arrangements were made with carefulness and dignity, resulting, however, in obtaining but 125 subscribers, who were from the following countries:

Germany and Switzerland, of whom 25 resided in Berne, 66; France, 30; U. S America, 3; Italy, 11; Spain, 5; Belgium, 4; Egypt, 1; Russia, 2; Argentine Republic, 1; Holland, 1; Brazil, 1. Total, 125.

Only a part of the subscribers attended the Congress. From the United States only our own delegate was present, Dr. A. W. Bayliss of Buffalo, N. Y., and this Association owes him sincere thanks for the able manner in which he represented, particularly in his statement made in the English language, in which he told the Congress how much we are doing for the advancement of Electro-therapeutics in this country, mentioning personally some of our members and their particular specialties.

In the foremost ranks were two of the honorary members of this Association,—celebrities in Europe,—Dr. J. Bergonie of Bordeaux, France, the editor of an electro-therapeutic journal in Paris, our firm friend, who always gives us full credit in every way; and second, Dr. Moritz Benedict of Vienna, an acknowledged authority, but with regret I have noticed how little he knows of our ways and institutions. In speaking of electrocution, he said that the doctors act here as executioners. If our dear confrère had been informed correctly, he would not have made this mistake, for the physicians pres-

* Read at the Twelfth Annual Meeting of the American Electro-Therapeutic Association, at Atlantic City, September 24, 1903.

ent at an electrocution are there only as witnesses to attest to the result of the procedure and confirm the death of the criminal, and have nothing whatever to do with the execution or the operation of the electrical apparatus. For my part, I am proud to see that in America humanity is practiced to all, even to criminals—in their last hours!

Sixty-four members took part in the discussion of papers, and we find no evidence that more than sixty-four subscriber members attended the meeting of the Congress.

The principal language of the Congress was French, but everybody was permitted to speak in his native language in reading papers or taking part in the discussion.

Seventy-nine papers were read by fifty-nine members and delivered as follows:

In French, 51; in German, 24; in Italian, 3; in English, 1. Total, 79.

They were valuable in representing the following branches of electro-therapeutics:

Electro-Physiology, Electro-Diagnosis, Electro-Therapeutics of Diseases of the Vascular System, Diseases of the Respiratory Organs, Diseases of the Digestive Organs, Dermatology, Diseases of the Genito-Urinary Organs, Nervous Diseases; one each on Tuberculosis, Surgery, Gynecology, Technique of Bacteriology, Therapeutic Applications and Technique, and Phototherapy.

EXHIBITION.

The Congress had arranged a very successful exhibition of electro-therapeutic instruments. Professor Kronecker, who did so much for the success of the Congress, gave for the exhibition the rooms of the Physiological Institute in the Berne University. The manufacturers exhibited many appliances and had all instruments in motion. The motor power was furnished by the firm of Oerlitson by a power of ten kilowatt.

The principal interest was centered in X-ray tubes, radiographic collections, pictures, and other instruments for radiography.

There were thirty-nine exhibitors, the largest contingent of whom came from Germany, 20 exhibitors. Next came Switzerland with 6; France, 5; Austria and Hungary, 4; Italy, 3; Spain, 1.

The various departments of the Congress were all well conducted, and enough praise cannot be given to the systematic arrangements made by the officers in charge; as well as the kind attention to all strangers by Professor Kronecker, whose modesty kept him in the background, but whose energy and forethought did much for the success of the Congress.

The Transactions of this Congress have been published in a large volume of 783 pages, and each subscriber has received a copy.

Electro-therapeutics has a great future, but some of us may not live long enough to see our efforts acknowledged by the general profession, particularly when this part of therapeutics is not included in the curriculum of our colleges; who rather rejoice in impeding the progress of that science in many instances.

The question may now arise, why this Association cannot find ways and means to have an International Congress of Electro-Therapeutics in America.

One of our honorary members, d'Arsonval, in an address before the Psychological Institute of Paris, recently predicted that electricity will be the sole medicine of the future. Your reporter is not quite as sanguine and prefers to give the patient the full benefit of any therapeutics.

In conclusion, permit me to urge upon you the desirability of holding an International Congress of Electro-Therapeutics, including an exhibition in this country, under the auspices of the American Electro-Therapeutic Association.



RADIOGRAPHY.*

BY HERMAN GRAD, M. D., NEW YORK.

INTRODUCTORY.

It may safely be said that skiagraphy has passed the experimental stage, and as a science it has attained to the dignity of being a positive means of diagnosis in fractures, dislocations, and foreign bodies. Heretofore, of all the symptoms that arise incident to the solution of the continuity of bone, crepitus held the foremost rank. Upon this symptom a positive diagnosis of fracture was made. This symptom, however, can be elicited only under exceptional circumstances. In many cases, no crepitus can be obtained, and yet solution of the continuity of bone of a very serious nature may exist. Nor is it of small significance that the elicitation of the symptoms causes distress and suffering; and when crepitus cannot be obtained, only a doubtful diagnosis of fracture is admissible. Hence arises the fact that without a skiagraph a positive diagnosis in every fracture cannot be made. Furthermore, even if the diagnosis of fracture is positive in a given case, the skiagraph will give much additional information, obtainable in no other way. A skiagraph shows with startling vividness the extent of the bone injury; the position of the fragments; the rotation; the overriding; the shortening and displacement—information of the utmost importance in the diagnosis and treatment of the injury. Therefore, no diagnosis of a fracture is complete—and certainly not scientifically so—without a skiagraph of the injury. With an X-ray plate of the injury of the bone at our hand, the diagnosis and treatment of the fracture become an open book. That fractures and dislocations can be diagnosed and treated intelligently and successfully without the aid of an X-ray picture is freely admitted, but that the diagnosis and treatment of these very fractures, so handled, become less problematical with a skiagraph at hand, must also be freely conceded. The importance of skiagraphy in fractures, dislocations, and foreign bodies being admitted, it becomes a

* Advanced sheets of the chapter on Radiography and Radiotherapy to appear in "Conservative Gynecology," by G. Betton Massey, to be published by F. A. Davis Co., Philadelphia, Pa.

question of what is the most practical way of obtaining an X-ray picture.

SKIAGRAPHY.

The practical application of the Roentgen rays in fractures, dislocations, and foreign bodies, requires the intelligent use of certain apparatus. With efficient apparatus at hand the technique of successful skiagraphy becomes very simple. We need for the purpose either a static machine or an induction coil, a Crookes tube, a stand, a fluoroscope, photographic dry plates, trays and a ruby lamp. With these seven pieces of apparatus we can go to work and diagnose conditions where the X-rays have so successfully been applied. It need hardly be recalled to what importance in diagnosis the X-ray has attained. A short description of each piece of apparatus used in producing a radiograph is necessary.

STATIC MACHINE.

To do efficient work in radiography with a static machine of glass plates, it is necessary that the machine should have at least ten revolving plates. While a radiograph can be obtained with a six-plate machine, these small machines are not practicable. With a twelve-plate static machine very good X-ray pictures can be made. The time of exposure is not very long, and, on the whole, if the operator has only this piece of apparatus in the office he will be able to radiograph every skeletal bone in the body, except the head and hips. For the latter regions of the body, the time of exposure with the static machine becomes too lengthy. The risk of a dermatitis in such a long exposure is very great. However, even the hips and head can be skiagraphed if the subject is not too fleshy. Young subjects admit easy penetration of the X-rays. It is not the object here to describe the construction of a static machine, but a few points may not be amiss to dwell upon. A static machine, while not a very delicate piece of apparatus, requires some care and attention on the part of the operator. A machine that is well constructed, and has good insulations on the metal parts, should do good work, if the machine is properly kept. It is necessary to keep the machine in a dry room where a certain amount of sunshine enters. The exposed brass parts should be kept free from dust, and the axle properly oiled. All

static machines, no matter what their construction, some means whereby the interior is kept dry. I have discarded entirely the use of calcium chloride for this purpose and instead the unslacked lime. Lime will not alone keep the interior of the machine dry, and prevent it from becoming



-A Modern Holtz Machine.

charged, but will do away with all of the unpleasant odor we find when the case of a static machine is opened. A machine with lime in it can be opened at any time and only a very slight odor of nitrous oxide gas will be encountered. Nor do the metal parts of the machine tarnish so readily as is the case when calcium chloride is used to dry the machine. The machine should be about 50 pounds in weight, in large brick (or unslacked). When the lime is in powder it has become useless and is of no further use for such purpose. After a time the lime slacks in the machine, and in doing so it becomes a powder. This powder must not be allowed to fly about the case and settle on the plates. The bricks of unslacked lime should be put in a box made of slats, and covered

with muslin or linen, to prevent the powder from flying about. Every six or eight weeks the lime is thrown out, and a new supply put in. In order that the machine should keep the charge it is necessary to have it run every day. If not in use, allowing the machine to run from five to ten minutes morning and evening with the sliding rods fully apart, will prevent the machine from discharging. With these little attentions, the static machine can be made very serviceable, and kept in readiness for use at any moment. When the weather is dry the machine should be aired for a few minutes each day. Start the machine off fully charged, and while running take the most convenient side door off, and allow the air to enter for three or four minutes. This airing will materially improve the capacity of the machine. Under no condition, however, should the interior of the machine be aired in wet weather, or during hot summer days when the humidity is great. A good motor to run the machine is a prime requisite in the use of a static machine, and nothing can replace a good electric motor. While any motive power will do the work, yet nothing is so handy for a physician as an electric motor. Gas and gasoline engines require much attention, and so does a water motor. Of course, if electricity is not available, a gas engine will probably be the least troublesome motive power. To run a static machine by hand successfully is out of the question. With these few precautions a thoroughly constructed static machine will do good work.

INDUCTION COIL.

An induction coil is an apparatus for the transformation of an electric current of low voltage and high amperage to one of low amperage and high voltage. In order to excite an X-ray tube, it is necessary to have a current of electricity of very high tension and low amperage. In a static machine we have just such a current. The current there is of tremendous voltage, but exceedingly low amperage. In obedience to certain definite electrical laws, the induction coil converts the ordinary commercial current used for power and lighting purposes into a current of high tension or "voltage." This transformation occurs under the following conditions: If we take a coil of wire attached to a galvanometer, we will notice that a momentary current will be induced in the coil when a

magnet is brought near it, although the magnet does not touch the wire. When the magnet is removed, another momentary current is produced, but this time the electricity flows in the opposite direction. It is on this law of induction in electricity



Induction Coil.

that the construction of an induction coil is based. An induction coil consists of a so-called primary core and a secondary winding. The primary core represents the magnet and the secondary winding of the coil of wire. When electricity is sent to flow into the primary coil, it becomes a magnet. At the time the circuit is opened, a current of electricity develops in the secondary winding by induction, the current flowing in the opposite direction; this phenomenon of induction repeating itself each time the current flowing into the primary closes. This opening and closing of the flow of electricity in the primary of an induction coil, is called "making and breaking" of the current. The current developed in the secondary winding of an induction coil is what is utilized in the production of the Roentgen

Indeed, this is the only kind of current that will give us the phenomenon of X-ray. The Roentgen rays can only be produced by an electrical current of high potential and low "amperage." As this particular kind of a current only develops in the secondary winding of an induction coil, at the instant of the "make and break" of the current flowing through the primary coil, it is essential to provide for the "making" and "breaking" of the current.

This is provided for by that portion of the induction-coil outfit called the interrupter. There have been many devices advanced for "making" and "breaking" of the current that enters the primary core, but the most successful of these devices is the electrolytic interrupter of Wehnelt, or some modification of the same. The interrupter consists of a glass jar in which is suspended a plate of carbon of a definite device. A platinum wire, also of a definite device, is so suspended that it is a certain distance from the carbon plate. This distance can be varied by means of a screw. The glass is filled with a sulphuric-acid solution—enough in quantity to immerse the carbon plate and the platinum wire. The electricity that is allowed to flow into the interrupter decomposes the water and the liberated gases around the platinum point, breaks the circuit, thus interrupting the current; the non-conducting material being the liberated gases. These gases, being lighter than water, rise to the surface and unite to form water again. The gases having left the platinum point the circuit is again closed, the electricity once more flows, and the phenomenon repeats itself indefinitely, the interruptions occurring with great rapidity, several thousand times per minute. The interrupter is a very important part of the X-ray outfit, and no time and labor should be spared in making it as perfect an instrument as possible. The platinum point in an interrupter after a while will be used up, and must be replaced.

THE FLUOROSCOPE.

The fluoroscope is a convenient device for holding the substance which fluoresces when brought into the vicinity of a Crookes tube in action. It is of a stereopticon shape—the opening at one end just large enough to fit over both eyes, to exclude all outside light. The best fluorescent material for practical purposes is the platino-cyanide of barium. These crystals

are spread over a cardboard in a very thin layer, which is fastened to the large end of the fluoroscope. The fluoroscope then becomes a dark box, and when in use should exclude all adventitious light. When the fluoroscope is brought into the vicinity of an active X-ray tube, fluorescence is excited in the crystals of the platino-cyanide of barium, and objects opaque to X-rays, when placed between the screen and tube, throw a shadow on the fluoroscopic screen. These shadows are what we see. We do not see the so-called X-rays, but the shadows on the fluoroscopic screen. When the hand is placed in front of the screen the bones become visible because the X-rays do not penetrate the osseous structures as readily as the soft tissues, and hence the crystals of the fluorescent substance at



The Fluoroscope.

these regions, receiving less X-rays, fluoresce to a less degree, and this relative degree of fluorescence of the crystals produces the effect of a shadow. It is this shadow that we see. We do not see the bone actually, but the shadow of the bone. It is of importance to bear this in mind, because seeing only a shadow means that we only see a surface of an object in a single plane; and if we wish to get an idea of the entire object, we shall have to look at the object from different angles, so as to see the shadows of the different planes. The fluoroscope is of great practical utility in surgery and medicine. Foreign bodies in the various cavities of the body, as well as tissues, and bullets in any part of the human body, can be seen and located with the fluoroscope. In fractures and dislocations, as well as bone diseases, the fluoroscope will afford much information, but not as much as the photographic plate. In diseases

of the chest, however, the fluoroscope finds great usefulness, because the various organs here can be seen in their natural position and motion. It certainly cannot be of trifling interest to be able to see a heart in action, the rhythmic contraction of the diaphragm, the up-and-down motion of the liver, spleen, and kidneys; the shadow of the mediastinum, etc.

PHOTOGRAPHIC PLATE.

In radiography the ordinary photographic plate is used, although manufacturers are putting up special plates for X-ray work. These X-ray plates differ very little from photographic plates. With ordinary plates used in a camera very good X-ray negatives can be obtained. A photographic plate is a piece of glass coated with a solution of silver bromide and gelatine. When a solution of silver bromide is exposed to sun or artificial light, the bromide solution becomes decomposed into the sub-bromide of silver. Expressed chemically, the Ag Br is changed to Ag_2Br . The same chemical change occurs on the gelatine-coated plate. A plate on which these chemical changes have taken place does not show anything visible, but when the plate is subjected to another chemical called "developer," the sub-bromide is converted into metallic silver. At this stage the plate is immersed in a "fixing bath," which dissolves off the silver bromide that was unaffected by the light. It thus fixes the plate and makes it permanent. The plate or "negative," as it is now called, is of a brown or black color, whereas, before the development, the plate looked white. As the bromide on the plate is so sensitive to all kinds of light, except the ruby light, it stands to reason that it must be protected, and all manipulations must be done either in the dark, or by ruby light. In photography the plate is exposed in the camera, but in radiography no camera is necessary, because the X-ray light that is to bring about the chemical changes on the plate can penetrate dark paper, for example, which is impervious to ordinary light. Photographic plates come in various sizes, but the most convenient sizes for radiography are the following: 5×7 , 8×10 , 10×12 , 11×14 ; under rare occasions, 14×17 . In ordinary plates for X-ray work the envelopes should not be forgotten, as they take the place of the camera. It is of importance to remember that the X-ray plates should not be kept in the same room where X-ray work is being done, as the plates

would necessarily become fogged. It is best to keep the sensitive plates in a tin box which is impervious to the X-rays. When the plates are to be used, they should be put into the envelopes in such a way that the film side of the plate should be next to the smooth side of the envelope. In this way one always knows where the film side of the plate is. While it is



Stand.

not absolutely necessary to have the film side of the plate towards the part to be radiographed, yet we shall get a better picture if this precaution is taken. In removing the plates from their original box, to be placed into the envelopes, great care should be exercised not to expose them to light. The whole procedure can be accomplished in a dark closet without the use of any light; although it is perfectly safe to expose them to the ruby-lamp light. The film side of the plate should not be handled with the fingers, as the moisture and heat of the hand will affect the film unfavorably, and when the plate is developed it will show spots from careless handling of the film.

While certain manufacturers are putting up X-ray plates which are ready for use, it is better for the operator to attend to these details himself, because in this manner only can he have control of those fine details of the work so essential to successful radiography.

STAND.

A stand is an arrangement for holding the X-ray tube while in action. As it is necessary to place the tube in various positions at different times, it is essential that the stand shall admit variations in its handle to accommodate the tube. There are now on the market many very excellent stands. A good stand must be stable; it should have a handle of wood or some other non-conducting material; it should admit various positions, and some simple device for obtaining these various positions. Too complicated a device is tiresome and impracticable. The simplest device is the best. It should also have some arrangement for holding up the attaching cords, as they are necessarily heavy if properly insulated. The base of the stand should be heavy, so as to be stable. When tube and plate are once placed in position there should be no further motion of the tube, as the focus would be disturbed. Therefore, the various screws on the stand should be well set.

TRAYS.

The trays are used for the developing solutions. For each set two trays are necessary. One is for the "developer," and the other is for the "hypo" solution, also called "fixing" solution. The various sizes of the trays should correspond to



Developing Tray.

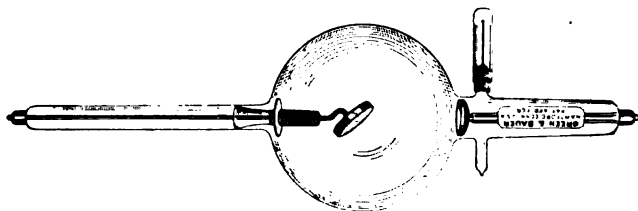
the sizes of the plates. The three most convenient sizes for practical radiography are 5 x 7, 8 x 10, 10 x 12. Hard rubber trays will serve the purpose well. It is best to keep one tray for the same solution. The "fixing" solution should always have the same tray. When the trays are not in use they should be kept clean and dry.

LAMP.

As the photographic plate is sensitive to all kinds of light except the "red" light, it is necessary to work only with red light during the development of the plates. For this purpose an oil lamp is provided, the sides of which consist of red glass. These ruby lamps, so called, are made in various sizes, but the smaller sizes are not practicable. For X-ray work a fairly bright light is permissible. The X-ray plate is not apt to fog so readily as an ordinary exposed plate. Electric lamps with red bulbs are very practicable devices for obtaining red light, but ordinary incandescent lamp bulbs are apt to be too light. However, with a little ingenuity, these electric bulbs can be toned down to the desired brilliancy of the light.

TUBE.

An X-ray or Crookes tube is a glass bulb, globular in shape, the air of which has been partly exhausted, the vacuum of the tube having been reduced to one-millioneth of an atmospheric pressure, or thereabouts. One tube may be exhausted to the same extent as another, and yet the two tubes will behave



X-Ray Tube.

differently when they are used for some time. The rarefied air in the tube becomes radiant when electricity is allowed to flow into this relative vacuum. In fact, this phenomenon of fluorescence of a vacuum tube led up to the final discovery of the so-called X-rays, by Wilhelm Conrad Roentgen, in 1895. To obtain an X-ray tube, with a proper vacuum, is not an easy matter. The manufacturer may follow identical steps in the preparation of his tubes, and yet some of the tubes will turn out well, while others will not. It is the degree of proper focus of the cathode stream upon the anticathode that is difficult to obtain. The reason for the great variability of the vacuum in various tubes, while not understood fully, is largely due to the

focus. A tube may be of a proper vacuum at one time, and the next time it is to be used the vacuum will have risen so high that the most powerful coil will not cause it to light up. A tube whose vacuum has become high will become somewhat reduced if allowed to rest for a variable period of time. These are interesting phenomena associated with X-ray tubes, which add to the difficulties of the problems of radiography. It means that before each exposure the tube should be tested, and its vacuum adjusted, if success is to be obtained.

Within the glass bulb of a Crookes tube are fused two terminals—usually one at each end. One terminal is called the cathode, and the other the anode. The cathode is made of aluminum, and its inner surface is made uniformly concave. The purpose of this concavity in the cathode is to focus the cathode rays emanating from it, it having been demonstrated that the cathode rays obey the laws of reflection. The anode should be made of platinum, as other metals easily melt, or give up gases, under the tremendous heat to which this part of the tube is subjected during the time the current is passing. The heat evolved at this point in the tube is so great that thin pieces of platinum promptly melt under the exposure to the cathode stream. It is therefore necessary that the anode should be constructed of a piece of platinum of considerable thickness. In tubes intended for the static machine alone a very thin anode will answer the purpose, but in tubes that are to be excited by a coil the anode should be *extra heavy*—particularly if the coil is one of considerable electrical capacity.

A certain quantity of electrical energy will be necessary to excite a Crookes tube that has been properly standardized as to the vacuum. As the vacuum of the tube becomes higher it will require more and more electric current to produce a proper degree of radiance. While in the one case the tube may back up a three-inch spark-gap, in another case it will back up an eight-inch spark-gap. By backing up a spark-gap is meant that the resistance to the flow of electricity in the tube is greater than the resistance of three inches or eight inches of air-gap. Air, as is well known, offers considerable resistance to the flow of electricity. Three inches of air space between the negative and positive electrodes of an electrical circuit offer a certain amount of resistance. If the resistance in the tube is less than that of three inches of air, the electric current,

always taking the shortest route, will necessarily flow through the tube; but as the resistance in the tube rises and becomes greater than that of the air, if the spark-gap is separated three inches, the circuit will be through the air. An X-ray tube in action that backs up a spark-gap of three inches is spoken of as a "medium" tube. When the tube begins to back up five or six inches of spark-gap, it is spoken of as a "high" tube. In the first instance the vacuum is medium; in the last it is high. In an X-ray tube it is necessary to have a certain amount of gases remain in the tube, as a perfect vacuum would defeat the object in view. The quantity of gases that remains in the tube after exhaustion determines the degree of vacuum of that particular tube. This quantity of gas, however, changes with each use of the tube, and the more the anode of the tube is heated, the greater the resulting change in the vacuum of the tube. Finally, the vacuum of a tube becomes so high that no amount of current can excite it—the resistance in the tube becoming too great. The current does not pass through, but sparks across on the outside of the tube. Under these circumstances the tube is apt to puncture and become useless.

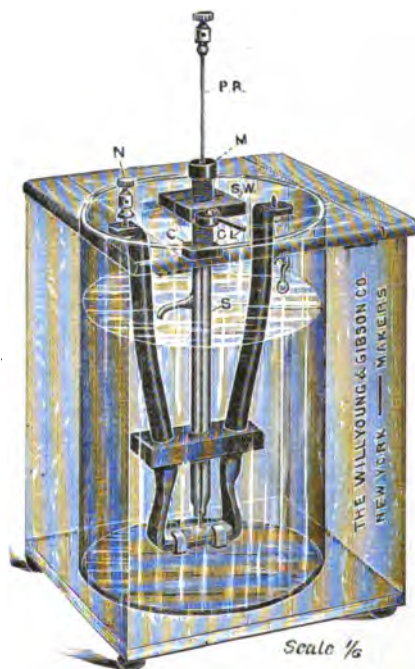
In view of the fact that the vacuum in the tube is so variable, it becomes necessary to have some practical provision made whereby this vacuum can be regulated at will. It has been found that, by providing means of introducing gas into a tube, the vacuum can be regulated at will. This is accomplished in various ways. During the manufacture of an X-ray tube a separate compartment is provided for, which communicates with the large bulb of the tube; in this tube are fused a small anode and cathode. On the cathode a plate of selenite is placed, or else some potassium hydrate of phosphorus. When the vacuum in the tube becomes too high, a current of electricity is allowed to pass through the auxiliary tube for one or two seconds only. The potassium hydrate, or any other substance that may have been introduced into the auxiliary tube, becomes vaporized, and the gases pass into the bulb of the X-ray tube, thus lowering its vacuum. Gundelach utilized the principle of osmosis in the lowering of the vacuum in the tube. He fuses a wire of palladium into the tube, the wire projecting outside of the glass. When the projecting wire is heated with an alcohol lamp, the hydrogen of the flame diffuses into the tube, or perhaps air is forced through the heated matter, thus

lowering the vacuum of the tube. Still another method of lowering the vacuum of the tube consists in subjecting the tube to heat in an oven. The heating of the tube displaces the gases which combined with the heated metal in the tube, and are resting against the sides of the tube, thus lowering the vacuum in the tube. Tubes excited by the induction coil however, must be lowered by more energetic means than heating. Gases must be introduced to lower the tube sufficiently.

To prevent the overheating of the platinum on the anode, various devices have come into use to prevent the destruction of this part of the tube. The most successful of these devices are the so-called "water cooling tubes." Water is made to circulate about the anode for the purpose of abstracting the heat from it. In this way the anode will withstand a very powerful current for a few minutes. Under ordinary conditions, an anode excited by a powerful induction coil will become red hot in a minute or two, rarely taking three minutes. With a water cooling arrangement, the excessive heating of the anode may be delayed for one to two minutes. When it is considered, however, that it is really unnecessary to have an X-ray tube in action for more than a minute or two at one time for skiagraphy, it will be seen that tubes which will stand so much stress are rarely necessary. In radiography, it is rarely necessary to have an exposure of more than two minutes at a time, even for stout persons. A hip can be taken in two minutes' times, with a good coil, if the apparatus and tube are in good order. With an apparatus not so efficient, longer exposure will be necessary; but under these conditions the tube can be allowed to cool for a few minutes, the patient in the meantime remaining quiet. When the tube has cooled sufficiently, the current may be turned on again, and the exposure completed.

In referring to the vacuum, tubes are spoken of as being "hard" or "soft." These terms are not so well chosen as the "high" and "low," because it is the degree of vacuum that is being referred to. Nevertheless, when the vacuum in a tube becomes high it is said by some that the tube has become "hard." When a tube has become high it is in danger of being punctured. A punctured tube at once ceases to functionate, and, instead of the usual radiance seen in a well-working tube, a violet light appears between the cathode and anode; and if

the puncture is a large one, even a spark will soon be seen to pass between the two terminals in the tube. Such a tube can be repaired by sealing up the puncture in the glass and re-exhausting the tube. Tubes thus repaired may never again become as useful as they were before, although it is frequently



An Interrupter.

the case that a repaired tube will turn out better than when it was new.

In measuring the degree of vacuum of a tube, we have recourse to the spark-gap which the tube backs up, the intensity of the radiance in the tube, the noise of the interrupter, or the general harmony in the working of the apparatus, which informs the operator that everything is working well. Recourse, however, must be had, even by the expert, to the fluoroscope for determining the degree of vacuum of a particular tube, at a particular time. The hand is a good skiameter after all. In the hand there are bones of various densities, and by examining these various regions of the hand, the degree of the vacuum

of the tube can soon be learned. This procedure, while eminently practical, and certainly very efficient, is not without considerable danger, however, to the operator. An X-ray hand is apt to be the reward of the too-zealous inquirer. If one does much X-ray work, this method of investigating the vacuum of the tube should not be chosen, as dermatitis of a more or less serious nature is sure to follow. Under these conditions, a skiameter is to be substituted for the hand, and the sooner the operator learns the use of the instrument, the better for his hands. There are a number of skiameters on the market. They are all based upon the same principle, that of interposing between the tube and fluoroscope some material which obstructs the rays. Small squares of tinfoil, or other suitable materials, are arranged in a circle. All the squares are numbered. By looking at the skiameter with the fluoroscope, one can express the particular degree of the vacuum of the tube by the number on the square that appears opaque to the light of that particular tube. An ingenious device for measuring the degree of vacuum was devised by Dr. Carl Beck, which he calls an osteoscope. Instead of using the living hand, the doctor uses the hand and forearm of a skeleton. He says, "The bones of the forearm and hand are fastened to a sheet of pasteboard, or similar translucent material; by being inserted in the frame of a fluorescent screen, it can be moved to and fro, so that the phalanges, the carpus or elbow, can be studied." He says further, "If a tube shows the bones of the osteoscope light gray and translucent, it is of excessive hardness; the contrast is insignificant, and therefore useless for Roentgen examination."

(To be continued.)



Editorial.

ELECTRICITY IN ACUTE INFLAMMATORY CONDITIONS.

IT has been the dictum of the profession for years that electricity could not be used without danger of doing harm in acute inflammatory conditions. When the status of the knowledge of the profession, as to the action of electricity in the treatment of disease, is recognized, this is not to be wondered at.

It might well have been said, until the advent of the milli-ampere meter, that electricity was as liable to do harm as good in all inflammatory conditions. This was because the continuous current was the current generally in vogue, when the polar actions of the current were little understood, and there was no way of determining the resistance and regulating the current employed. To the accidents which occurred are due largely the prejudice that exists to-day against this most valuable therapeutic agent. Had the early investigators been provided with the modern Holtz machine, instead of the current of larger amperage—the continuous current—it would have been otherwise. But those physicians who, following the suggestions and not the skillful technique of Apostoli, have inflicted upon their patients accidentally, or for want of proper knowledge, injuries which made their condition worse than their primary trouble—electricity is condemned and hated by them to-day.

While certain acute inflammatory conditions may be relieved by the employment of the continuous current, it is not the current to which we look to-day for the relief of inflammation.

There is nothing more certain in medicine, to those who understand the actions of high-potential currents of small quantity, than their efficiency in the treatment of acute inflammatory conditions. Barring the inflammations associated with necrosis, or some form of micro-organism, not superficially located, there are no inflammatory conditions which the high-potential modalities will not either relieve or cure.

When we appreciate the fact that such currents are innocuous, not appreciably electrolytic, not destructive to cell protoplasm,—and consequently not to germ life—the safety of the

agent must be recognized. The *modus operandi* of these currents and discharges upon inflammatory conditions is most rational. When we appreciate that the associated state, which renders inflammatory conditions chronic, is *local stasis*, a state for which nature has provided no relief, the necessity of an agency which will act as a starter—a *vis-a-tergo*—to overcome this condition of stagnation, will be readily appreciated. For relief of these conditions, simple measures have been for centuries employed—rubbing, friction, stroking, massage, and counter-irritants. These have done more to afford relief to such conditions than drugs in the past. The scientific application of mechanical vibration contributes much to the relief of local stasis, but lacks the deep penetration and tonic action of the currents of high potential. The contraction of cell protoplasm, and the associated muscular contraction as applied to the regions of local stasis, induce an unloading of the regions of infiltration by expression and increased activity of the organs of excretion; and at the same time restores circulatory conditions, and induces active local metabolism which repairs the local conditions. The more acute the condition, the less infiltration to be relieved, and consequently the more prompt the restoration. In the first stages of acute abscesses, as felons, boils, and tonsillitis, *i. e.*, preceding suppuration, abortion is effected. In cases of traumatism, neuritis, and visceral congestion, no means afford such prompt relief as the early administration of high-potential currents.

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THE SIGNS OF THE TIMES.

THE prejudiced mind of the great profession, wisely conservative, but often aggressively dogmatic, is turning. Men who for years have occupied the first rank in the councils of the profession have often resisted progress along lines with which they were unfamiliar, on account of their own lack of knowledge and an unwillingness to investigate new fields, and have also prejudiced others against them. That such men should hold positions and control the policies of medical education in the great colleges of the country is deplorable, and is so recognized by all progressive physicians who investigate progressive rational therapeutic measures. It is evident that truth will at last prevail, and recognition is apparent.

Those who have defied, ridiculed, or stigmatized with the name of *quack*, honest, progressive physicians who have aggressively insisted upon the acceptance of rational therapeutics are yielding, and the prospect of early recognition and general adoption of these methods by the profession, if not in the curricula of some of the moss-backed medical colleges of the country, is apparent. We would repeat again that it is, as it always has been, in the great profession of noble sentiments and high ambition; that opposition is very often a sign of ignorance.

* * *

ACCOMMODATIONS AT ST. LOUIS.

TO the present time very few members of the association have made application for rooms at the Inside Inn, upon the grounds of the St. Louis Exposition, where the sessions of the American Electro-Therapeutic Association are to be held. This fact indicates either that the attendance of the association will be small, or that the members are not availing themselves of the opportunity to stop at this hotel. We are informed that the hotel is well managed in every detail, that the rooms are comfortable, and the table satisfactory. The service is reported to be far better than that of the majority of permanent St. Louis hotels. Those who care to avail themselves of the opportunity to stop at the Inside Inn should forward \$5 and engage their room at once, or it is probable that they will not be able to secure their accommodations there.

* * *

MEMBERSHIP IN THE AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION.

WE repeat again for the benefit of our readers that any physician in good standing and a member of a County Medical Society in affiliation with the American Medical Association may become a member of the association upon the presentation of an application signed by two members in good standing. The membership fee, pending the passage of an amendment to the constitution, has been made \$5, which includes the first year's dues. Applications for blanks and particulars forwarded to the Editor will receive prompt attention.

Progress in Physical Therapeutics.

CURRENTS OF HIGH FREQUENCY AND HIGH POTENTIAL.

EDITED BY WALTER H. WHITE, M. D.

The High-frequency Current with the Glass Vacuum Electrode as an Adjunct to the X-Ray. By May Cushman Rice, M. D.

"All electro-therapeutists admit that the coil gives a greater amperage than the static machine, but the spark discharges of the latter give a greater number of alternations than the former, while the high-frequency coil gives a still greater number of alternations.

"William Benham Snow in his late work on Static Electricity says: 'There is undoubted advantage in some cases in the treatment of which a stronger chemical discharge is beneficial, from the greater amperage of the coil. On the other hand, the positive vibratory effect of the static high-frequency which is easily appreciated by holding an electrode in the hands, has its advantages in overcoming local stasis and congestion. This latter action, combined with its antiseptic and germicidal properties, accounts for the prompt results in most of the cases treated.'

"My attention was first called to the use of the high-frequency current in connection with the X-ray after treating a rodent ulcer for three months with the X-ray without effecting a cure. Similar cases had responded promptly, but to my surprise this one refused to yield. Dermatitis was produced several times, whereupon rest was given between treatments until the dermatitis had subsided. Each time as the lesion appeared to be almost healed, it broke down again and discharged freely. Becoming quite discouraged with the X-ray for this case, it occurred to me to try the effect of the high-frequency current applied by means of the glass vacuum electrode. I grounded the positive conductor and connected the glass electrode to the negative, according to the method suggested by Snow. There was marked improvement from the beginning and four treatments effected a cure. There is now practically no scar tissue to be seen." Reports 13 cases miscellaneous, 6 epithelioma, 1 lupus.

"Chronic eczema has been cured with only four or five applications such as those previously mentioned. Acne vulgaris, and itching skin diseases have responded in a remarkable manner, and intense pruritus has been relieved for 24 hours after a single application. Fissures produced on my

own hands as an X-ray operator yielded to two treatments, while fissures from other causes have done equally well. Boils have been aborted, typical attacks of migraine quickly dispelled by moving the electrode with a mild current over the affected nerve.

"The field for the high-frequency current with the glass vacuum electrode, whether energized by the high-frequency coil, resonator, or static machine alone is a broad one, the best evidence of which is that though not new it is becoming more and more recognized as a therapeutic agent by the open-minded of the medical profession."

The Action and Therapeutic Value of Currents of High Frequency and High Potential. By Curran Pope, M. D.,
The Medical and Surgical Monitor.

Dr. Pope reports 11 cases treated by H. F.: 5 cases neurasthenia, 1 atonic dyspepsia, 1 sciatica, 1 gastric dilatation, 1 lithæmia, 1 gout with arthritis, 1 anæmia with mitral insufficiency. The latter case special course of baths and exercises for the heart disease. By use of the single pole, which may be either positive or negative, only that the positive is a little sharper while the negative possesses a soft breeze effect. He says: "The action of the current is due to three causes: first, electrical bombardment; second, active circulation produced at point of application; third, to the presence of violet rays. From clinical observation, I feel that the action of the H. F. current is germicidal in proportion to the presence of the violet ray."

LARYNGOLOGY, RHINOLOGY, AND OTOLOGY.

EDITED BY W. SCHEPPEGRELL, A. M., M. D.

Non-tuberculous Hemorrhages of the Air Passages.

Nasal hemorrhage may occur from arrest of hemorrhoidal bleeding; from the cure of skin diseases; from pressure on the abdominal veins during pregnancy, and from all diseases which obstruct the return flow of blood (Lafayette Page, Amer. Med., No. 25, Dec., 1903). In the elderly, hemorrhage from the air passages points to incipient arterio-sclerosis. Congestion of the cerebrum and meninges is liable to produce epistaxis. Five cases of tracheal hemorrhage following influenza are reported. The cause of hemorrhage in the epidemic fevers is still obscure. Hemophilia is the principal predisposing cause of hemorrhage. Among local causes of epistaxis, deflections of the septum should occupy the first place. That from neoplasms is often the most difficult to control. Many cases of cerebral apoplexy are doubtless averted by nasal hemorrhage. It sometimes re-

lieves congestive headache. Fatal hemorrhages of the upper respiratory tract are reported in children under a month old from syphilis. Every mechanical means should be exhausted in determining the bleeding point. Cocaine and suprarenal extract are invaluable in checking the flow and diminishing the reflexes, thus aiding in diagnosis. Keane believes every nose and throat surgeon should be prepared to ligate the external carotid in case of violent hemorrhage following the removal of the tonsils or adenoids.

The Rational Treatment for Mouth-breathing.

Normal nasal respiration is essential to health, and where any obstruction exists it should be removed. W. H. Fitzgerald, in an article on this subject (Med. Rec., Sept. 5, 1903, and Annals of O. R. & L., Mar., 1904) is opposed to the use of the spray, douche, and solution treatment; regarding them as contrary to nature, and never to be practiced. They are often excitants, not only to the nose, but to the accessory cavities and ear. Nose breathing, in the absence of anatomical causes preventing it, can be brought about through practice. At night, he uses a mouth guard consisting of a small strip of adhesive plaster (zinc oxide) worn vertically across the center of the mouth, and during the daytime has the patient breathe forcibly through his nostril at the rate of one respiration per second for ten seconds, and this exercise repeated eight or ten times during the day. A permanent patency of the Eustachian tube can be brought about by nasal breathing, while the Eustachian catheter is often harmful, acting as a mechanical irritant, and thus assisting the progress of an already thickened and, perhaps, irritable membrane.

Thrush.

This disease, which is so common among children, is generally due to uncleanness on the part of the nurse or parent, the *Oidium albicans* being readily introduced, and rapidly propagated in children's mouths (Illoway, Med. News, No. 17, Jour. Amer. Med. Ass'n, Mar. 12, 1904). The treatment of the milder forms is easy with hyposulphite or borax, but in the severer forms Illoway has had the best results with a mixture of tincture of iodine and glycerine, 1-2 dram of the former to 3 1-2 of the latter, applied locally to the parts with a camel's hair pencil. Two cases are reported. He thinks the glycerine is an important factor in the treatment. It loosens up the mycelium and makes its removal sure. This plan, he thinks, surpasses any that has heretofore been recommended in its readiness of application, and in its harmlessness and rapidity of action.

On the Relation of Aural Disease to Those of the Nose and Naso-pharynx.

As showing the relation between diseases of the nose and throat to the ear, Kostljanetz (St. Petersburg Med. Wochen., Annals of Otology, Rhin., and Laryng.), examined 1000 patients with alterations in the nose or naso-pharynx, and found 107 with otitis, 167 with Eustachian catarrh (acute 41, chronic 120); 46 showed sclerosis, 4 showed deafness as a result of intoxication, 11 showed affections of the labyrinth, 3.29 per cent. in all. The alterations in the nose or naso-pharynx were either directly or indirectly produced by continued early inflammatory affections. The author regards this percentage as perhaps actually too small, and believes that the number of ear diseases owing their origin to the nose or naso-pharynx is in reality larger.

Treatment of Acute Periostitis of the Mastoid Process with Application of Heat.

In the first stage of acute inflammation of the mastoid process hot applications are frequently of service, though some cases seem to be benefited by cold applications. A suitable apparatus, devised by Ullmann, and similar to Lieber's coil, was used by G. Alexander (Jour. of Eye, Ear, and Throat Diseases, Nov.-Dec., 1903, in eighteen cases. The temperature of the water was from 44 to 46.5° C., and the length of the application was from one to seven hours.

A Case of Diphtheria at Seventy-six Years of Age.

This is a case reported by A. Belcham Keyes (Jour. Amer. Med. Ass'n, No. 5), and contains nothing of special interest except the extreme age of the patient, showing the necessity of making culture in all cases of throat disease, no matter what the age of any suspected case of diphtheria may be, also to show the probability of its dissemination by adults of all ages, in whom the disease may fail to cause symptoms.

On the Relation between Adenoid Vegetations and Enuresis Nocturna.

In 115 cases of adenoids, examined by Dr. Zwillinger (Medizinisch-Chirurgische Presse, Oct. 3, 1903), six children showed enuresis nocturna. Three of the cases were immediately cured after the operation. In all cases, therefore, of this affection, the author recommends the examination of the child for adenoid vegetations.

RADIOGRAPHY.

EDITED BY HERMAN GRAD, M. D.

Lectures to Medical Practitioners on Physics Applied to Medicine.

Lecture II.—Details Concerning the X-Rays. By Sir Oliver Lodge, F. R. S., from Archives of the Roentgen Ray of April, 1904.

The following extract from this valuable paper will be read with interest by all students of the X-ray:

"Much advance, almost of a revolutionary character, has been made recently in the science of electricity—advance which must have a practical bearing.

"The cathode rays are flying electrical particles, called electrons, actual particles—I cannot say particles of matter, because they appear to be the particles of which matter is composed. They are particles of electricity. They may be called atoms of electricity—a phrase used by Clerk-Maxwell about forty years ago, before there was any clearly apparent experimental justification for it, and used then almost apologetically. But now we know that electricity is really an atomic thing, in the sense of having indivisible particles, and these particles are called electrons. They fly along in the cathode rays; their motion constitutes all electric currents; they go round and round in magnets, and, in fact, they form the substratum of the whole electric science. When they are intercepted they give rise to radiation; when they revolve, they also give rise to radiation. It is their acceleration which excites all radiation, and when they are suddenly stopped, as they may be when impinging on a solid target, they give rise to X-rays. Wherever you have these flying electrons, these cathode rays—sometimes called Beta rays, for they constitute one of the varieties of radiation from radium—wherever you have these rays striking and stopped suddenly, the X-rays take their origin.

"The X-rays are not particles at all, but waves or solitary pulses in the ether. I likened them last time to a whip-crack, to one single solitary shell; they have extraordinary penetrative power. Moreover, they travel in absolute straight lines. They are not refracted or deflected by any substance, nor can they be bent aside. They may be stopped and be made to cast shadows, the sharpness of which depends only on the smallness of the radiant point; but, unlike the waves of light, they cannot be bent. Lenses, prisms, magnets, electric charges, have no power over them. Hence, they may be passed through all manner of substances, traveling through in a straight line path, and thus they throw the sharpest possible shadows if their

source is a point. If X-ray shadows are blurred, it is because the rays proceed from more than a point."

"Now, in order to produce the cathode rays, flying at such a speed as will enable us to obtain X-rays, we must make them move in an exhausted tube.

"The cathode rays come flying off without obstruction, reach a maximum speed, and are more suddenly stopped. The higher the vacuum, the thinner is the pulse of the X-rays, and the more penetrating they are. If there is even a very minute quantity of residual, this obstructs the path of the cathode rays, and they impinge with less speed. In that case they do not generate X-rays of quite such extreme suddenness, and the result is the rays are not quite so penetrative. For some purposes this is useful; for other purposes more penetrative rays are required.

"I shall say something more about the use of the soft tube next time. As a matter of fact, I believe it is true that a soft tube does more damage to the skin than a hard one. The rays from a soft tube are not so penetrative; their effect is more superficial. Some think it is owing to that that you get the burn. There is something further, however, to be said upon that.

"These electrons—the cathode rays themselves—may be emitted through the tube, too, and, as a matter of fact, in addition to the true X-rays a certain number of Beta rays or cathode rays are emitted, I suppose by reflection from the cathode or the target; the cathode rays that strike that target are to some extent reflected from it and to some extent penetrate the glass. It is owing to the escape of these electrons that the vacuum has a tendency to go up gradually as the tube is used, and the tube thus has a tendency to become practically useless. One would have thought that use would have spoiled the vacuum instead of increasing it; instead of that it goes on improving until the tube becomes too far exhausted. Matter seems really to escape through the glass in the shape of atoms of electricity, for it cannot get through except in the form of electrons; the constituents of the matter escape and thus the matter itself escapes. If you hold an electroscope near the bulb, you will get effects showing that these electrons are escaping.

"In order to get less penetrating rays and more discriminating shadows, the vacuum in the tube must be lowered. This can be done either by heating the bulb so as to drive off the trace of condensed gas from the glass, or by heating a platinum wire which protrudes through the walls of the tube, which again gives off some occluded hydrogen; or it can be automatically effected, as I have shown you, by a supplementary small-sized vacuum tube attached to the main bulb, and arranged in such a way that whenever the sparks find it difficult

to pass from the main bulb they may jump by another spark-gap to the side tube, as an alternate path therein generating a trace of gas which will enter the main bulb, lower its vacuum, make the main path easier, and so automatically throw the side tube out of action until it is again wanted.

"Lastly the vacuum in an X-ray bulb can be lowered by applying to it more power and overforcing the bulb beyond the point at which it was excited during the process of manufacture, thus extruding a deep-seated gas, as it were, or, more probably, vaporizing some of the solid; so making the tube "soft" for this high power, whereas, when directly low power is applied, it immediately becomes hard again, presumably because the vaporized material has instantly recondensed. A "soft" tube has more superficial action, and is therefore more liable to cause dermatitis than a "hard" one with penetrating rays.

"As to those X-rays which start at the point of impingement of the target, the radiant point, may be asked, "Do they start in all directions equally or do they come off in some directions more than in others?" You can see by the phosphorescence of the glass that they come from the front of the target. The target, therefore, casts a shadow; the one part of the tube is illuminated and the part behind the target is dark, but as far as the illuminated hemisphere is concerned, I believe they start in all directions equally, unless the flat plane of the target is disturbed by a little pimple or a dimple in it so that it stops some part of the rays unequally. But if the target is even, you have from the point of impingement the X-rays starting equally in every direction. If the concentration of the cathode rays is too strong, if the focus is too sharp, then you nearly always get a point where you melt the target. When a particularly sharp focus is required—as for localizing foreign bodies in the eye—a piece of osmium, a very rare substance, less fusible than platinum, is used as a target. But the very sharpest focus is not generally employed, because a less sharp focus is not so apt to pierce the target. Instrument-makers have found by experience the best distance at which to set the target.

"Wherever these cathode rays are stopped, X-rays take their origin. Hence we expect from every part of the bulb, where the cathode rays strike, a certain emergence of X-rays. Thus every part of the bulb gives off some X-rays. Hence we have a radiant source, almost a point, a small patch, and surrounding it a large area giving off some supplementary rays. All those rays which you get from anywhere except the point spoil the shadow, blur the definition, and, in fact, spoil the radiograph.

"I have said that the X-rays are not the only rays emitted by a bulb. It appears that some of the electrons escape through the

glass, for if a proof-plane be held anywhere in its neighborhood, negative electricity can be collected, provided the proof-plane is removed quickly enough, or the bulb simultaneously stopped, so that its ionizing power shall not discharge the proof-plane. It may be that these negative charges are due to the induced effect of positive charges inside the glass, which positive charges are creeping back from anode to cathode as they best can; and it is to give an easy path to these slow-moving ions that a supplementary anode or positive electrode other than the target is desirable. But the target itself should always be made one of the anodes, in order to encourage its bombardment by negative electrons. The position of the supplementary anode has been the subject of much experimenting; it has even been placed behind the cathode, a region where the positive electricity tends to accumulate. But that is not the best place for it. The best place has been found by a long series of trials on the part of the experimentalists and instrument makers, and the whole bulb has been through a long process of evolution, which has resulted at last in the present orthodox forms. Every part of the bulb now has its meaning; the sleeve in which the cathode is situated, together with the size of the cathode and the amount of space between it and the glass, all represent what has gradually been found to be best. It is necessary to leave a space for the positive ions to creep around and get behind the cathode, otherwise they will get in the way of the bombardment. The object is to allow a body of slow-moving positive ions to crawl back near the glass and get to the cathode behind, leaving a clear space in the axis of the tube for the free flight of the real projectiles—the cathode rays or the flying electrons. The current is conveyed conjointly, both by these which move quickly—20,000 miles, or so, per second—and by the probably still more numerous positive ions which move comparatively slowly.

"It does not matter very much where the positive or supplementary anode is placed; wherever it is, it furnishes a supply of positive ions which crawl along near the glass, and it is well to have a supplemental path by which these ions can get out of the way. The space where they are very fond of getting is at the back of the cathode, in what is called the sleeve of the cathode. They are heavy things, being atoms of matter—which we are beginning to consider quite a massive sort of thing—and they get to the cathode, and in that way complete the circuit. Hence it would seem a good plan to put the positive anode in the cathode sleeve. This has been attempted several times, but it does not seem to be quite successful. In the Cox record tube it is put behind the anticathode. This is very satisfactory, always provided none of the supplementary rays strike it, by escaping the target and forming a false radiant point. One convenient thing in this

other German pattern tube is that the positive pole is out of the range of fire. Here is a supplemental bulb to get rid of some of the positive ions.

"An attempt was made at one time to use a much larger cathode and to seal it into the glass; not to have any sleeve at all, but to make the cathode part of the boundary of the tube. It looked all right, but it did not do at all, and it is clear there must be some little space, behind the cathode, so that the positive ions may be able to make their way round to the back."

RADIOTHERAPY.

EDITED BY J. D. GIBSON, M. D.

Acrodermatitis Controlled by the X-ray. By Dr. D. W. Montgomery, Med. Record, July 30, 1904.

He considers the group constituting "the continued acrodermatitides" as characterized by their location on the extremities of the members, more particularly on the fingers and toes; by their incessant recurrence in the affected locality, by not extending for a long time to any other region of the body, and by their obstinate resistance to treatment. Three forms of the malady are described—a vesicular form, a pustular form, and a form in which there are both vesicles and pustules.

The case reported falls under the head of the vesicular group. The patient was given nine exposures to the X-ray and the results were very satisfactory and decisive.

A Comparison of Phototherapy, Radiotherapy, and High-Frequency Therapy in Skin Diseases. By Allen, The Journal, July 30, 1904.

The writer sums up his paper with the following conclusions:

(1) In the vast majority of cutaneous affections the Roentgen ray is of greater utility than either the actinic or the high-frequency methods.

(2) In lupus the Finsen method, though tedious and disagreeable, is efficacious. The combined ray and high-frequency spark may prove to be equally as good.

(3) The actinic method is less beneficial in cancer than the X-ray.

(4) The high-frequency method is exact, no more disagreeable than actinic, and for small lesions of the epithelioma and lupus vulgaris, lupus erythematosus, and many skin diseases, gives quicker and better results.

(5) All three can be combined advantageously, for the different stages and phases of a large class of affections.

DIETETICS.

EDITED BY SIGISMUND COHN, M. D.

Dietetics in Summer Diarrhea. By Benjamin Edel Helprin, M. D., Medical Record, July 23, 1904.

The author of this paper emphasizes the question of "Dietetics in Summer Diarrhea." No matter how suitable ordinarily, the moment an infant becomes sick, the diet becomes unsuitable. The great indicator to the suitability of the diet is the intestinal condition. When the mother reports any variation from the normal yellow stool, the question of diet should immediately arise. The presence of curds in the stools, or vomiting, clearly indicates too much milk. An intestinal rash, the "hunger cry," or the febrile condition; in fact any untoward condition responsible for persistent abnormal stools, if the intestines be not primarily at fault, gives the physician strong presumptive evidence of the necessity for dietary change. While in health, the customary diet of the infant is about 32 ounces of milk in 24 hours. This diet must now be supplanted by a diet more easily digested. Generally he starts with albumen water for the first day; the strength of this preparation varies with individual need, but the usual method is simply to add the white of one egg to 18 ounces of sterile water. About five grains of ordinary sodium chloride makes this more palatable, and the addition of a little brandy or whisky is salutary both for its stimulative and astringent effect. The quantity and intervals of feeding are best judged by a study of the case. After this, "Barley Water No. 1" may be tried. It is prepared by adding a heaping tablespoonful of any reliably prepared barley flour to each pint of sterile water, and boiled for twenty to thirty minutes; just sufficient milk-sugar should be added to make the food pleasant to the taste. Should the intestinal condition warrant it, this preparation may be doubled by an additional quantity of the flour. In most of the cases it is still advisable to withhold milk for a little while, and if the barley water becomes monotonous and distasteful we may change to other preparations of the same class, like cornstarch and granam. It is always indicated to tide over weakness concurrent with the reduction or exclusion of the milk by giving some tonic, and any suitable tonic may be given in the feedings, or given independently.

A point to be impressed is the necessity to wake the child for each feeding, as there is generally an apathetic disinclination to take even the much-lessened nourishment.

The return to milk should proceed very cautiously, and but a few ounces of milk are at first permissible, and gradual increases should be made only under very favorable conditions.

Frequently condensed milk will prove more satisfactory.

Sometimes lavage is necessary, and this has proven often the salvation of an infant in otherwise discouraging circumstances.

While the author is not opposed to the commercially prepared food, he prefers to return to milk.

Diet in Chronic Heart Disease. By Dr. Theodor Schott, The Lancet, London, July 16, 1904.

The author of this paper about the diet in heart disease considers the following two principles as fundamental: Everything must be avoided, first, which excites the action of the heart, and second, which impedes the action of the heart.

An excitation of the heart is effected by strong coffee, strong tea, and strong alcoholic liquors, while impediment of the heart action will take place by everything which interferes with the digestion of the stomach or produces flatulence, or causes a considerable distension of the stomach.

The harm may be done in three ways: first, the diaphragm is pushed up against the lungs so that inspiration is impeded, and the shortness of breath and dyspnoea thence arising are peculiarly injurious to sufferers from heart disease. Second, the distended stomach also presses the diaphragm directly against the heart, forces the heart upward and outward, displacing it in the direction of its space in such a way that its action can only be carried on with a greatly increased effort. Third, the abdominal pressure is also augmented, and therefore the abdominal vessels are compressed, therefore the blood pressure in the abdominal vessels will rise, and the heart will be forced to overcome a greater resistance than before. The consequence is that the cardiac muscle will suffer by this trouble.

The author lays down some rules in regard to the diet. Such patients should take small amounts of food at short intervals—every three hours is often enough. The last meal of the day should be taken 2 1-2 or 3 hours before bed time. Each meal ought to have about the same nutritional value, because this, apart from its utility for digestion, conduces to its uniformly beneficial effect upon the heart. Soups, because of their bulk and low nutritive value, should be taken in small amounts; not over a few tablespoonfuls. New bread, whether brown or white, and freshly baked cakes, should be avoided totally. Toast, or zwieback made without sugar, or the crust of rolls may be taken. Among vegetables, the following are to be avoided: beans, peas, lentils, sauerkraut, red cabbage, leaks, onions, garlic, and celery. Potatoes in the form of purée, or small, boiled in water, are to be preferred to baked potatoes; turnips and carrots should be eaten only when young and fresh. Animal food, in its various forms, especially fish

and poultry, are allowable, except eels, fat goose breasts, and goose-liver pies, rich sauces or mayonnaise, salmon, lobster, and crabs. Oysters, clams, and game seldom do harm, if fresh and prepared in a plain style. Highly smoked or salted fish or meat is objectionable. Among fatty substances, butter and cream are the best. Fat bacon, ham fat, oil, hot seasoning, and red or black pepper, are injurious. All foodstuffs containing these substances are to be avoided. Vegetable salads without hot seasoning, and particularly when made with lemon juice, are permissible. Easily digestible fruits stewed with the addition of a little sugar can be recommended, particularly on account of their favorable influence on gastro-intestinal peristalsis. For the same reason, raw fruits, such as apples, pears, apricots, peaches, and oranges are often desirable. Walnuts, filberts, and Brazil nuts are injurious. Ice in any form, whether it is iced drinks, fruit ices, or puddings, should be abstained from. Neither should anything very hot, be taken. It is impossible to urge too strongly that sufferers from heart disease always require a mixed diet. Too much animal food may cause irritation of the kidney with hypertrophy and dilatation of the heart. An entirely vegetable diet is no less injurious. Schott regards tobacco with great disfavor because there are, besides nicotine, other substances which are injurious. He recommends giving up smoking altogether. Generally, exercise in the open air for a short time after meals is preferable to sitting still. It is quite essential to study the individual characteristics of the patient, and the treatment should be modified according to the symptoms.

HYDROTHERAPY.

EDITED BY CURRAN POPE, M. D.

Insomnia.

Gorton (Medical Record) calls attention to the hygienic treatment of these cases, which is so often neglected, and which in many instances is of far more value than the medicinal. The hygienic treatment consists in the use of the various hydrotherapeutic measures, such as the warm full bath, the cold pack, sitz bath, foot bath, the cold rub, the ingestion of hot drinks, and regulation of the mode of life. He states that in many cases the first requisite in treatment is change of environment; this in itself is often all that is necessary. Getting away from the stress of life, from business cares and worries; from the depressing influence of well-meaning but tactless relatives or friends, is often imperative; and this should be more generally insisted upon. However, a man feels that he is essential to his business and cannot leave it; a woman cannot leave her chil-

dren. Often the financial problem cannot be surmounted, and so the matter drags along until a point is reached where something *must* be done, and sacrifices are made which could have been avoided had the situation been controlled by a firm hand from the outset.

The warm bath given just before retiring, followed immediately by a hot drink, is of great value. In the administration of the bath, the patient's face should be bathed with cold water, and the head above the eyes enveloped in a towel wrung out of cold water. This is an important and necessary point in technique which is usually neglected. It prevents cerebral congestion, and the sensation of vertigo which often follows the prolonged warm bath if given without the cold head compress. The patient should lie in the bath quietly from fifteen to twenty-five minutes, and the water should be kept at a temperature of 98°. After emerging from the bath, the patient must not be rubbed dry, for this has an exciting effect. The excess of water should be wiped away quickly, and the patient at once put into bed and given a glass of hot milk and the hypnotic selected. The milk or hot drink must be so hot that it can only be sipped.

The cold wet pack is equally efficacious. Here again the cold head compress must be used. The sheet is wrung out of water at a temperature of 70°, and quickly applied to the patient, who is left in the pack from one to two hours.

The warm sitz bath, at 95°, for twenty minutes to an hour, exerts a distinctly sedative and anodyne effect. A much lower temperature may be used if the duration of the bath is only from two to five minutes. The cold sitz bath is contra-indicated in acute inflammatory processes of the abdominal or pelvic organs.

These treatments secure their good results by depletion of the cerebral circulation.

The author speaks highly of the use of trional in connection with these measures, but condemns sulphonal and opiates.

The Hot Full Bath.

The hot full bath is defined (Medical Record, Feb. 27, 1904) by Grosse as a bath above 100° or 102° F. It should cover the whole body to the jugular fossa, and the temperature should be 107° to 108°. The patient should enter it slowly, so that one or two minutes elapse before he is fully immersed. He should make no necessary movements to increase the sensation of heat. Grosse does not favor the long-duration bath. He has never given it higher than 108°, or extended the time beyond eight minutes. There is no danger of catching cold after this bath, so long as the patient returns within a quarter to half an hour to shelter where he cannot catch cold. The diuresis is

increased. There is anemia of the internal parts with dilation of the arterioles. The heart action is accelerated. When the duration is short, the bath acts as a stimulant to the heart, but if too long continued, it may induce heart failure.

Its action is based on: (1) powerful stimulation of the entire nervous system for a brief period; (2) an intense revulsion of circulation, tending to hyperemesize the skin and unburden the inner organs; (3) a perspiration more abundant than after any other form of bath; (4) a raising of metabolism; and (5) the creation of a sometimes valuable leucocytosis.

It is indicated, therefore, whenever it is desired to incite energetically the metabolism or create a "curative fever"; when there are toxic substances to be eliminated by perspiration; and when it is wished to remove exudations and stagnations in the internal organs; and, lastly, in marasmus, when there are fetid masses in the intestines, in case of pus collection anywhere in the body, and whenever, by thickening of the secretions, pus could be retained, as in otitis media, epididymitis, etc., and in all highly febrile conditions. As special indications, he mentions all maladies of the upper air passages, lung troubles, rheumatic diseases, and all forms of climacteric troubles, syphilis, some ophthalmic disorders, neuritis, and neuralgia. While some authorities consider the hot bath contra-indicated in central nervous disease, some more recent neurologists have shown good effects, as in myelitis lumbodorsalis, hemiplegia, progressive pseudoparalysis, etc. Once in a case of locomotor ataxia, he advised it, and had difficulty in stopping the treatment, as the patient was inclined to overdo. It has also been recommended in some of the infectious diseases: in incipient influenza, infantile convulsions, colics, etc.

He suggest the name "Baelz" for the bath, as corresponding with the terms Brand bath and the Ziemssen bath.

Influence of Daylight in the Progress of Malaria: More Especially in Connection with Quinine Treatment. By Gunni Busck. American Journal of the Medical Sciences, Philadelphia, June.

Busck reviews the work done in this connection by King, Harrington, Leaming, and others, and arrives at the conclusion that the cause of the special effect of quinine preparations on malarial patients lies in the power of these preparations to make the plasmodia sensitive, so that they are destroyed or weakened under the effect of daylight. He bases his supposition on the following: 1. The special effect of quinine in malaria can hardly be explained entirely as a direct outcome of its toxicity with regard to plasmodia, and if we look for an explanation of this effect, we must not leave out of consideration a peculiarity so distinct as the power to make micro-

organisms sensitive to light. 2. Quinine preparations have decided sensitiveness-arousing qualities, as was shown by Ullmann. 3. According to Jacobson and Dreyer, light, even after passing through a layer of animal tissue, can exercise its microbicidal effect on the intensity of the light. 4. The tissues of the human body are pellucid, and even if only a comparatively small portion of the surface of the body is exposed to light, the blood, and with it the plasmodiæ, will, on account of its continuous circulation, all the same be affected by the light. 5. If these premises are correct, they indicate the advisability of treating malarial patients with sun baths or electric-light baths in addition to quinine.

Constitutional Low Arterial Tension. Louis Faugeres Bishop.
New York Medical Journal, June 11th.

Bishop finds that some patients suffer from continuous low arterial tension without the necessary symptom of circulatory disease, an individual abnormality. Some of the patients are feeble, but others respond to the demands; when so responding, there is an improvement in the tone. This condition may give rise to alarm on the part of the physician, but when the patient can be watched from year to year, it is shown to be a physiologic state of the individual case. The special form of low tension, however, which he notices in this article is that which is the result of a constitutional condition, probably due to some inherent defect in the nervous system preventing its proper control of the blood vessels. Patients who suffer from this low arterial tension are apt to manifest other symptoms of defective nervous control. The most important form of treatment is systematic exercise. There are other conditions where iron and arsenic improve the condition when it becomes marked; still others where hot baths are indicated. Cold bathing seems to be unsatisfactory. These are in cases where the patients are not suffering from any definite disease, but realize that they are not normal, and are fortunate if they fall into the hands of a practitioner who can diagnose the condition and treat it accordingly.

Saline Hypodermoclysis in the Treatment of Pneumonia.

F. P. Henry (Berliner Klin. Wochenschrift, 1904) has not used this as a routine measure, but is inclined to think this a mistake, for, beside its positive benefits, hypodermoclysis has the negative merit of being perfectly harmless. Theoretically, it is indicated in every case. It dilutes toxins and favors their elimination; it preserves the alkalinity of the blood, and does so by supplying a defective substance—sodium chloride: and finally, it tends to prevent heart clot, a frequent cause of death in pneumonia. Statistics in a disease in which so much depends

on the age, previous habits, and condition of the patient, and the *genius epidemicus*, may be misleading. The writer has found hypodermoclysis efficient in continuous employment since 1889, and believes ultimately it will be generally employed. He used 50 gr. of sodium chloride to one pint of distilled and sterilized water. The daily amount injected varies from 8 oz to 16 oz., and is repeated *pro re nata*. A large syringe with hollow needle attachment, or the aspirator, for tapping the chest, may be employed. At present he divides the agents employed in treatment into fundamental and accessory, including among the former those that influence the toxemia, placing first hypodermoclysis, and second hypodermic injections of quinine, and the carbonates of guaiacol and creosote. Among accessory agents are the local applications, alcohol, ammonia, morphine, digitalis, strychnine, nitroglycerine, camphorated oil, etc.

PSYCHO-THERAPY.

EDITED BY LESLIE MEACHAM, M. D.

Some Objections to the Use of Suggestion.

A few years ago many persons, even among physicians, doubted the real existence of the phenomena described under the general term of hypnotism. Although no intelligent man to-day denies the reality of the phenomena, comparatively few physicians make intelligent use of suggestion in their work. If asked why they neglected this important therapeutic agent, they would probably give one or more, and perhaps all of the following reasons: "The use of suggestion will endanger the professional reputation of the physician; it will injure his practice; it will afford opportunity for blackmail; it may be of physical danger to the patient; it may be a mental or moral injury to the patient; it will only benefit hysterical women." There may be other excuses offered for neglect of duty, but these will cover the list fairly well.

As to the first objection, I believe it may be said that if a man's reputation is in such a perilous condition that it will not stand the searchlight of publicity, he had better omit not merely a part of the agencies whereby he may relieve the sufferings of humanity, but make an entire change of profession. The same argument will apply to the second objection, with the additional one that patients so easily disturbed by the methods of the physician should be allowed to seek other advice, while the clientele is enlarged from the ever-increasing number of people who recognize that calomel, jalap, and kindred remedies are not the only therapeutic agents that a conservative practitioner may employ. As to the third reason it may suffice to

say, that any physician who hypnotizes a patient will preserve that person's respect. Thousands of people have been treated by suggestion, but no instance is on record in which a physician has been in any way injured by reason of having hypnotized a patient. There has never even been a case in which a layman, even, has been attacked upon these grounds. The second set of reasons bearing chiefly upon the possibility of a patient being in some way injured have a seemingly better basis, since in the past not a few physicians of eminence, from the late Ernest Hart down, have viciously attacked hypnotism and suggestion as dangerous therapeutic agents. Suggestion acts very powerfully upon some people, and it would be useless to deny that it, like all other valuable agents, is capable of doing harm, but that is no more reason why it should be neglected than that we should eschew carbolic acid as an antiseptic because it is employed occasionally by suicides; or morphine as an analgesic and antispasmodic, because there are habitués. And while there are many instances of carbolic-acid poisoning in its careful use by physicians, there is not a single recorded case of permanent injury following the strictly therapeutic use of suggestion.

A few instances have been known where hysterical people were overexcited during injudicious attempts by physicians to employ suggestion, and it may be slightly harmful in some cases of depressive mania, or melancholia, because it does not succeed in relieving the patient, but the same objection will apply to all other unsuccessful therapeutic agents. Unfortunately, there are no measures that are universally successful. Some cases are recorded in which serious injury to the patient has been done by unskillful and careless operators, or those whose zeal in making strange or repeated experiments, in order to gratify idle curiosity or pseudo-scientific interest, led them into indiscretions. Still, there has been no agent which has not gone through the experimental stage and, alas, too many have proven wholly injurious and without therapeutic value. The many vain efforts to relieve the consumptive with Koch's tuberculine may be instanced. It is to-day practically acknowledged by all competent observers that the careful use of suggestion, even in the deeper stages, for therapeutic purposes is devoid of danger. But the deeper stages are not essential to good results with the majority of patients.

A final objection that may be raised is that the physician has not the necessary skill to secure the desired results. This may be true in the more difficult cases. Then he should refer the patient to an expert, just as he would an eye or ear case to the proper man. Thereby he will save the patient and his friends from falling into the hands of the many quacks calling themselves scientists, metaphysicians, osteopaths, and other names capable of impressing the laity; all of whom secure

excellent results, occasionally, in functional disorders with a psychic basis, by the use of suggestion, either directly or indirectly.

No fact is better established in medicine than that all cases not relieved by the usual therapeutic agencies, and which have been helped by some one of the "isms," can be better treated by direct suggestion, as employed by an intelligent physician. I have watched carefully, and endeavored to be impartial in observation, and while I have known patients to try "Christian Science" after suggestion had failed, and receive no benefit, while many, after trying all the veiled methods of suggestive treatment, have received prompt relief by suggestion intelligently applied by a physician. It is not urged that the patient be told that he is being treated by hypnotism or even by suggestion. It has been constantly maintained in these columns that the best results are often gained when the patient is not fully informed as to the exact agent which is employed in his treatment, and many patients have received suggestions, and even formal hypnosis, without having been aware of the fact.

J. H. Cleaver, M. D., of Council Bluffs, Iowa, in the Medical Herald of St. Joseph, Mo., makes a stirring appeal for the home treatment of chronic invalids who are so often thrown into sanitariums or into the hands of quacks. His advice as to the handling of such patients is excellent, and he fully recognizes the psychic element in all such cases, and the value of suggestion. We quote: "If the practice of medicine was a science, like mathematics, physicians would fare better with their patients, and meet with little interference from the outside. But, as things exist, so many influencing factors are at work that the successful physician, generally speaking, must be so constituted that at almost any business he applies himself to, every faculty must be brought into use. Tact, patience, perseverance, ingenuity, and a plausible sincerity and honesty must be with it all." He calls attention to the fact that physicians study the phenomena of diseased minds without any degree of familiarity with the normal mind and its little-understood functions, such as telepathy, clairvoyance, hypnotism, etc. He paints in striking colors the effects of mental activity upon the secretions and excretions of the body, and shows what a wonderful number of adjuvants, in the way of drugs and physical measures, can be employed for the purpose of affecting the mind of the patient. It is only when the author comes to speak of hypnotism that he gets beyond his depth. He gives Mesmer and Charcot equal credit with Liebault for scientific work in investigating the laws of mental therapy, accepts Hudson's absurd propositions as gospel, and caps the climax by asserting that the use of hypnotism makes slaves of patients,

robs them of their self-control and their personal responsibility. If Hudson established any proposition, it was the harmlessness of hypnotism, and the necessity of it being employed in suggestive treatment. From the standpoint of the physician, and not of the hypnotist, the article is an excellent one.

SOCIETY MEETINGS.

THE PROGRAMME OF THE PAPERS TO BE READ
BEFORE THE FOURTEENTH ANNUAL MEET-
ING OF THE AMERICAN ELECTRO-THERA-
PEUTIC ASSOCIATION ON THE 12TH,
13TH, 14TH, 15TH, AND 16TH OF
SEPTEMBER, 1904.

"Some Observations on the Medical Uses of the Constant Current," Daniel Roberts Brower, Chicago, Ill.

"The Therapeutic Application of the Continuous Current," Truman Abel Pease, Norwood, N. Y.

"Exhibition of a New Current Controller and Discussion of the Methods of Therapeutic Control of Street Main Currents," George Betton Massey, Philadelphia, Pa.

"The Cataphoric Treatment of Cancer," Amedée Granger, New Orleans, La.

"Clinical Reports of Some Interesting Cases Treated by Electricity," Samuel Fairweather Wilson, Montreal, Can.

"Clinical and Experimental Effects of Electrical Currents of High Potential and Frequency," John Holcombe Burch, Baldwinsville, N. Y.

"Therapeutic Action of High Frequency Currents," Walter Henry White, Boston, Mass.

"Electro-Therapy of the Psychic and Sympathetic Neurone Centers," Charles H. Hughes, St. Louis, Mo.

"The Physiotherapy of Neurasthenia," T. Riviere, Paris, France.

"The Value of the Roentgen Ray in the Diagnosis of Fractures," Mihran Krikor Kassabian, Philadelphia, Pa.

"Diagnosis of Calculi," Russell Herbert Boggs, Pittsburg,

"Static Electricity," Jefferson Demetrius Gibson, Denver, Col.

"A Case of Hyperidrosis of the Axillæ Cured by the X-Ray," George H. Stover, Denver, Col.

"Violet Light Baths; Their Physiological and Therapeutic Effects," Ernest Albert Weil, Paris, France.

"The Use of the Ultra-Violet Light in Therapeutics," Albert Eugene Stern, Indianapolis, Ind.

"Locomotor Ataxia Successfully Treated with Ultra-Violet Rays," Joseph Monroe Liebermann, New York, N. Y.

"Some Aspects of Phototherapy," Charles Rea Dickson, Toronto, Canada.

"Photo-Therapy in Chronic Diseases," John Harvey Kellogg, Battle Creek, Mich.

"The Importance of Associating Other Physical Measures with Electricity in Therapeutics," William Benham Snow, New York, N. Y.

"Three Cases of Inoperable and Recurrent Sarcoma Successfully Treated by the Roentgen Rays," George C. Johnson, M. D., Pittsburg, Pa.

The members of the Committee of Arrangements are C. H. Hughes, M. D., *Chairman*; A. V. L. Brokaw, M. D.; John Young Brown, M. D.; C. D. Chaddock, M. D.; Pinckney French, M. D.; Mark Ray Hughes, M. D.; B. M. Hypes, M. D.; L. H. Laidley, M. D.; and W. G. Moore, M. D., all of St. Louis. These gentlemen have arranged social features and amusements for the ladies who will accompany members, which will appear in the completed programmes which will be distributed at St. Louis. Any further information can be obtained by writing to the Secretary or the Chairman of the Committee on Arrangements.

Clarence Edward Skinner, M. D., LL. D.,
Secretary.

BOOK REVIEWS.

TRANSACTIONS OF THE AMERICAN ROENTGEN RAY SOCIETY. Fourth Annual Meeting, Philadelphia, Pa., December 9 and 10, 1903. Published by the Association.

This volume contains the full transactions and papers of the Association, read at its last meeting and is a volume which will be a valuable addition to the library of the radiographer and radiotherapist, on account of the number of excellent papers which it contains. Copies of the number may be procured from the Secretary, Russell H. Boggs, M. D.

RADIOTHERAPY AND PHOTOTHERAPY, INCLUDING RADIUM AND HIGH-FREQUENCY CURRENTS, THEIR MEDICAL AND SURGICAL APPLICATIONS IN DIAGNOSIS AND TREATMENT. By CHARLES WARREN ALLEN, M. D., Professor of Dermatology in the New York Post-Graduate School; Consulting Dermatologist to the Randall's Island Hospitals; Consulting Genito-Urinary Surgeon to the City Hospital; Member of the American Medical Association, the American Dermatological Association, the New York Dermatological Society, etc., with the co-operation of MILTON FRANKLIN, M. D., Lecturer on Electro-Radiotherapy, New York Polyclinic Medical School, and SAMUEL STERN, M. D., Radiotherapist to Dr. Lustgarten's Clinic at the Mount Sinai Hospital; Clinical Assistant to the Skin Department of the New York Post-Graduate Medical School. Published by Lea Brothers, New York and Philadelphia. Price \$4.50 net.

The writers of this book have contributed a most valuable addition to the literature of the "New Therapy." The subjects are treated in a most thorough and exhaustive manner.

Part I. includes a general consideration upon Radiation, and the History and Uses of the X-ray, and the Methods of its Production. Due attention in this section is paid to all types of apparatus, both static and induction coils, with consideration of the various types of machines in use. The writer has been fair in his dealing with the subject. The physics of the subject has been carefully treated and the various types of tubes and apparatus are well illustrated.

The subject of High-Frequency Apparatus has received careful attention and the subject of High-Frequency Currents has been treated briefly but scientifically. Attention is given to the various types of screens and shields. Skiagraphy has received brief but practical consideration, the subject of the uses of the X-ray and Diagnosis, fluoroscopic and photographic, being treated in accordance with the most recent developments of the subject. The subject of Radiotherapy is the one in which the author has shown a degree of familiarity with the technique and ingenuity in methods, especially in the treatment of skin diseases, not excelled, if equaled, in any work which has been published to the present time. The author's large clinical experience in the treatment of skin diseases is evidenced by the large number of illustrations showing the results of treatment.

It is a remarkable work and should be carefully read by all members of the profession, and will be found of special interest by those who are investigating the subjects of progressive therapeutics.

A TEXT-BOOK OF ALKALOIDAL THERAPEUTICS, being a condensed résumé of all available literature on the subject of the active principles added to the personal experience of the authors. By W. F. WAUGH, M. D., and W. C. ABBOTT, M. D., with the collaboration of E. M. EPSTEIN, M. D. Published by the Clinic Publishing Co., Chicago, 1904.

This work is devoted, as its title implies, to the uses of the active principles in medicine, and if drugs are to be largely administered in the future, deserves the careful consideration

of the profession. The days of nauseous doses are passing. The public demand for newer therapeutics and relief from the bitter dose and nasty ointment and liniment has passed. Newer therapeutics will place in the hands of the physician the single-minded curative. Shot-gun prescriptions must go: science demands it. Dr. Abbott and the writers of this book are to be congratulated upon the energetic way in which they are attempting to lead the profession on to more intelligent methods.

THE PRACTICAL APPLICATION OF THE ROENTGEN RAYS IN THERAPEUTICS AND DIAGNOSIS. By WILLIAM ALLEN PUSEY, A. M., M. D., Professor of Dermatology in the University of Illinois; Member of the American Dermatological Association, and EUGENE WILSON CALDWELL, B. S., Director of the Edward N. Gibbs X-Ray Laboratory, University and Bellevue Hospital Medical College, New York; Member of the Roentgen Society of London; Associate Member of the American Institute of Electrical Engineers. Second Edition, thoroughly revised and enlarged. Published by W. B. Saunders & Co., Philadelphia, New York, and London. Price \$6 net, in cloth.

The prompt appearance of the second edition of this valuable work is an assurance of the cordial reception which the first edition has received. The work contains everything that is practical in Radiography, dealing with the subject from all aspects. The author of the part of the work devoted to Radiography has presented all the salient points of progress in that field, and offers many unique and original features in the methods of posturing patients for the purpose of obtaining the best results and most truthful expression in the skiagraph. He considers both the static machine and coil apparatus, but gives a decided preference to the coil for this department of X-ray work.

In the second section of the work, Dr. Pusey gives an elaborate consideration to the subject of Radiotherapy, and quotes extensively from foreign authorities. From the large number of cases reported, in all upwards of 280, the author's experience is shown to be very large, and the enthusiasm and fairness with which he treats the subjects is a guarantee not only of the possibility of success, but of the establishment of these methods upon a scientific and firm basis. We congratulate the authors upon the thoroughness with which they have treated their respective subjects. The volume comprises 674 pages and is profusely illustrated.

MECHANICAL VIBRATION AND ITS APPLICATION TO THERAPEUTICS. By M. L. H. ARNOLD SNOW, M. D., Professor of Mechanical Vibration in the New York School of Physical Therapeutics, Associate Editor of the *JOURNAL OF ADVANCED THERAPEUTICS*, and Late Assistant in Electro-Therapeutics at the New York Post-Graduate School. Published by the Scientific Authors' Publishing Co., New York. Price \$2.50 net, in cloth.

The author of this work has considered the subject from the two aspects of Vibro-Massage and Spinal Stimulation, de-

voting much attention to the relation of massage and the principles involved to the application of vibration apparatus. The author has built upon the scientific developments of massage and added the principles which have been demonstrated in later years to be of material value in therapeutics—the scientific methods of spinal stimulation.

Chapters are devoted to the Circulatory, Muscular, Nervous, and Digestive Systems, and special attention has been given to practical technique. The author's practical methods and the general style of the work will commend themselves to the reader. Upon the final pages of the work is given an elaborate scheme showing the groups of muscles which perform the various movements of the different parts of the body, their origins, and insertions, and nerve supply. This will be of value not only to the workers in vibration therapy, and in every department of Physical Therapeutics, who wish to investigate the action of the skeletal muscles. A scheme is also included showing the location of the principal motor points of the body.

The work is printed on excellent paper, well bound, and comprises 275 pages, 9 half-tone plates, descriptive of the methods of treatment, and 50 other cuts descriptive of apparatus. We believe that this is a book that will be highly appreciated by those who are interested in the employment of mechanical vibration, and by all who wish to investigate the subject. The author is to be congratulated upon the general character of the work.

NEW AND IMPROVED APPARATUS.

This department is devoted to publishing, with illustrations, drawings, and descriptions, new apparatus, electrodes, etc., for the benefit of those interested in the progressive improvements in armementaria.

THE BOSTON LAMP.

The lamp shown in the cut above is designed to run from any direct-current lighting circuit, and is used for ultra-violet work. The instrument is simple, compact, and substantial. It is mounted on a piece of slate twelve inches square. At the extreme left is a resistance tube, which regulates the current and allows the proper amount to pass. The wires from the incandescent lamp socket are attached to the binding posts, just above the name in the illustration.

To operate, the lamp is removed from the slate, the crystal lens brought into direct contact with the area to be treated and the lens used as a compressor. The electrodes used are of iron. They last for hours, either steady or intermittent run.



ning. It is but the work of a moment to insert new electrodes. The rays given off from the lamp are rich in ultra violet, and almost all light rays are excluded. It is not necessary to use water or any other cooling device. There is absolutely nothing about the lamp to get out of order.

The price of the outfit complete is but thirty dollars. The manufacturers are Swett & Lewis Co., 18 Boylston Street, Boston, Mass.

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No. 10.

ELECTRICITY IN MEDICINE.*

BY A. D. ROCKWELL, A. M., M. D., NEW YORK,

Neurologist and Electro-Therapist to the Flushing Hospital; formerly Professor in the New York Post Graduate Medical School; ex-Electro-Therapist to the Women's Hospital in the State of New York, etc.

In assuming the duties to which you have called me, it seems fitting to say to the members of this association, and especially to those who have but recently become interested in this fascinating field of research, that widely different conditions confront them than confronted those who did the pioneer work of electro-therapeutics.

Then there existed but the rudest constructions for practical work, and no instruments for precision. Now we have at our command innumerable gradations and manifestations of electric force, and while yet we know not what electricity is, we so understand the causes which govern it that it becomes obedient to our will in innumerable ways. Here, as a part of this wondrous exhibition, we are literally "in the midst of a boundless magazine and arsenal filled with all the weapons and engines which man's ingenuity and skill have been able to devise." And we impatiently await the originating genius who shall give to us some fundamental principle that will lift the subject of electricity in medicine to a far higher plane of scientific exactness and efficiency than it had yet attained. I firmly believe that we have in this all-pervading force something that has an inherent potency and promise of development that will render it more nearly a panacea than any other one thing.

As yet no approach to any such claim can be made for it. In many ways empiricism still attends its use, and it is still the home of much of ignorance and credulity. But deep within the soul of man lies a "creative spirit which can fashion every-

* Inaugural address delivered at the Annual Meeting of the American Electro-Therapeutic Association held at St. Louis, September 13, 1904.

thing that is destined to exist," and which will some day arouse the world to its vast powers and possibilities in medicine. What part shall we have in this renaissance, in this phenomenal development which is sure to come? What nationalities and what individuals will be foremost in rearing the indestructible structure of an advanced therapeutics? American genius and enterprise, it seems to me, hold a place all their own among the peoples of the world, and the derivation of one of our striking characteristics is illustrated in the story about the elephant. If a Frenchman, a German, and an Englishman were each asked to write a full description of the elephant, his size, physical structure, habits,—in short, the characteristics which differentiate, their several methods of procedure would be as follows: The Frenchman would gayly repair to the *Jardin des Plantes*, note what he could see of the animal in his environments of captivity, and immediately proceed to write his description; the German would repair to his study, and from the depths of his moral consciousness evolve his idea of the nature of the animal; while the Englishman would immediately fit out a vessel, provision it for a six-months' or a year's trip, seek the animal in his native haunts, and write his description from an actual practical knowledge. The Englishman is the practical man, and from him the American inherits his genius for practical application.

What we lack, however, in the department of intellectual effort, is the attribute of creative power. The man with imagination, who is content to wait patiently and draw little by little from the depths of his moral consciousness, is the man who evolves ideas that are concerned with principles that are eternal. The kind of thing that he does comes to the world as practically a creation.

The American mind is fertile in invention rather than in original conception. The thing created by the more profound and subtle thought of originating genius is taken in hand by inventive genius and put to a score of practical uses. It ingeniously juggles with something the world already has in its possession, and the results are of undoubted value and of wide application, but it does not, like the creative faculty, reveal some hitherto unknown universal law whose discovery constitutes an epoch in the world's history. What it does is more for the day and hour, useful in its time and place, but soon

to be superseded by other and higher forms of construction. The discovery of gravitation, of the power of steam, the discovery of Galvani that gave us the galvanic current, and of Faraday, showing that magnetic influence can induce currents in neighboring circuits, are veritable creations that have revolutionized life. And so, too, with those epoch-making discoveries, along the line of, or kindred to, electric manifestations—the X-ray and radium.

The discovery of radium was no mere accident, but was the result of patient inductive reasoning, on the basis of the long-recognized phenomenon of radio-activity in connection with some form of matter, and is likely to result in a radical reorganization of scientific hypotheses. We are wrong, therefore, when we say that in the realm of science Americans are noted for their originality. The haste which characterizes us as a people; the restless activity which demands at once the thing desired; the development of the perceptive faculties to the detriment of the imagination;—all these tend to render the acutely intelligent mind of the American of to-day impatient of delay and averse to prolonged abstract thought. How rare the deep devotion to science and to pure truth! How rare the sublime resignation of the immortal Kepler! "Is it much for me," said he in his isolation and extreme need, "that men should accept my discovery? If the Almighty waited six thousand years for one to see what he had made, I may surely wait two hundred for one to understand what I have seen. All this and more is implied in love of wisdom, in genuine seeking of truth, the noblest function that can be appointed for man, but requiring also the noblest man to fulfill it."

With mankind in general, however, and especially with our people and this generation, what will most quickly supply the need of the hour is the thing sought, and is pursued with such persistency of effort and with such alert activity that we are called the most inventive of people.

Fulton gave us the steamboat, Morse the telegraph, Edison the electric light. In the popular mind these names stand to-day as the highest expression perhaps of original scientific thought. But high as these names stand, and justly as they are honored, they do not represent the highest grade of creative intelligence. They were great inventors, and magnificently solved the need of the time, but the principles with which they

worked, and out of which they fashioned the details of practical service were not of their creation.

Watt is greater than Fulton; Galvani than Morse; Faraday than Edison. Each decade, each year even, witnesses the birth of innumerable inventions, many of which genuinely add to the comfort and progress of the race; but an intellectual creation, the discovery of a principle hitherto unknown, having in it the promise and potency of innumerable inventions, are so infrequent as to constitute veritable epochs in the world's history.

This association is in its way unique. For more than a decade now, we have met annually to discuss the relation of electricity to disease. All other societies, whether of general medicine, or some one of its special departments, have to do with many remedies. Herein lies both our strength and our weakness. Our strength, because in focusing our energies and keenest intelligence upon a single point, as it were, it may be possible to as truly illuminate it, as does the concentration of the sun's rays upon any given point. Our weakness, because in thus concentrating and limiting our efforts, we may possibly come to forget that we are physicians first and electrotherapeutists after.

Bear ever in mind the fact that the history of therapeutics is a history of blasted hopes. Where one new therapeutic agent has accomplished even a respectable fraction of what was in the beginning claimed for it, a hundred perhaps have miserably failed. It is human nature to eagerly aspire to be the first—or among the first—to exploit the new.

In the rush for precedence conservatism is cast to the winds, and, instead of waiting for a wider experience before giving expression as to the advantages and limitations of the new agent or method, we too often rush into print with the grossest exaggerations, with statements of therapeutic results that will not for one moment stand the test of a closer analysis.

Honesty of purpose and absolute integrity in clinical reports constitute the one great shield and buckler of defense against the false and shallow optimism of the charlatan. Yet it is not enough that we be simply honest. Charlatans, it is true, are not generally honest, yet charlatanism is not inconsistent with personal integrity.

The man from whom the writer first obtained his impulse for investigation along these lines was unconsciously a char-

latan. His experience was large; his integrity beyond question; but the basis of his charlatanism was his profound scientific ignorance. He enunciated no ideas, neither did he understand the principles underlying the cures that were wrought. He worked blindly, and honestly believed that his simple, old-fashioned induction was equal to all sorts of impossible things, and well illustrated in his life and character the old truth that "the human mind follows the line of least resistance, believes what is easy and for personal interests to believe, and, except after the most careful training, cannot be trusted either to observe or to report its observations with accuracy."

Combine, however, honesty of purpose with education and trained power of observation, and we have a lever which is capable of lifting this department of medicine to a plane of unquestioned honor and dignity. For, say what you will, electro-therapeutics is even yet a *terra incognita* to the vast majority of practitioners of medicine, and is looked upon by many, if not with contempt, with polite and patronizing indifference.

Let me urge, therefore, upon the members of this association, that while they abate not one whit their enthusiasm, to see to it that the judicial faculty be not subordinated to impulse and desire. "Be true if you would be believed." Understate rather than overstate, for in so doing, the foundations we are now laying, will become so strong, each stone in the structure so firmly mortised, that the superstructure will be an enduring monument to our honest and earnest endeavor.

Finally, allow me to express an opinion and utter a word of warning. Many years ago a physician said to me, "Why do you not enlarge your peripheries?" If that remark was applicable to one who studied electricity as a whole in its relation to disease, how much more is it to him who studies but a part. To my mind a grave error has been committed by leaders in this special field of work, in relegating practically to the "limbo of forgotten things," the electric modalities of Galvani and Faraday.

Following their lead, others less distinguished have either abandoned or never attempted the use of those indispensable manifestations of electric force, the galvanic and faradic currents.

Elaborate electric paraphernalia, static and high-frequency,

adorn the consulting rooms of many a physician who is quite ignorant of the fundamental principles on which is based the use of electricity in medicine, and who would be altogether perplexed if asked to differentiate in the use of electric modalities. Valuable as these newer forms of electricity are, they constitute not the whole of electro-therapeutics, and he who fails to study the art of differentiation, and confines his efforts to any one electric modality in response to the popular trend and because of ease of administration, will oftentimes widely miss the mark.

If in this presentation I have given expression to views that seem to you too pessimistic, and have seemed to speak against a too lively enthusiasm, you will please attribute it to a temperament by nature conservative. In dietetics it is far from necessary for the most perfect health to constantly urge the taking of more food. The natural tendency of the healthy man is to over, rather than to under-feeding, and this results too often in paralysis and decay. And so, too, in the therapeutic exploitation of new fields. Let once the commercial spirit overmaster the spirit of truth, as night follows the day, so surely will our request degrade rather than elevate the special department to the advancement of which our energies are pledged.

The Sydenham.
Madison Avenue and 58th St.



THE CATAPHORIC TREATMENT OF CANCER.*

BY AMÉDÉE GRANGER, M. D.,

Member American Electro-Therapeutic Association.

PART I.

Mr. President and fellows of the American Electro-Therapeutic Association:

In the light of our present knowledge of the very increasing death rate from cancer, as reported by observers, both in this country and abroad, I believe that a discussion of the electrical treatment of this disease will be both timely and productive of good. It is the object of this paper, therefore, to open this discussion by presenting a report of twelve cases of cancer treated by mercuric cataphoresis.

To be consistent with the accepted view, that any treatment not in harmony with the pathology of the disease is hardly scientific, I will mention briefly the view of the ætiology and pathology of cancer which I have adopted, and also the physics of the method of treatment employed.

Cancer is primarily a germ disease. This germ causes in the first place a retrograde metamorphosis of the cells of the parenchyma or stroma of the organ or part infected, by which they revert to the embryonal type; and in the second place a morbid proliferation of the newly formed cells. This proliferation of the infected or malignant cells extends irregularly into the surrounding healthy tissue, resulting sooner or later in destruction of the healthy cells. The disease remaining local until the infected cells reach the circulation by extension through the lymphatics or blood-vessels.

Clearly, the indications for treatment are to completely and thoroughly eradicate the disease and its proliferations in the surrounding apparently healthy tissues before the malignant cells can reach the general circulation. To accomplish this with the knife is almost impossible, because it may require the removal of only a half-inch of apparently sound tissue on one side of the growth, and three inches or more on another side

* Read at the Annual Meeting of the American Electro-Therapeutic Association, Sept. 15, 1904.

(Figs. 1 and 2); and if all the malignant cells are not eradicated, recurrence is certain, with subsequent more rapid growth. Furthermore, it is not impossible that the knife may have at times implanted some living cancer cells in the fresh wound.

Of the electrical treatments, including radiotherapy, known to me, certainly none is more scientific or meets the indications better than mercuric cataphoresis. This method, which has been introduced and so well championed by our esteemed fellow, Dr. Massey, of Philadelphia, consists in the destruction of the malignant tissues by the cataphoric diffusion through them of the nascent salts of zinc and mercury.

PHYSICS OF THE METHOD.

The salts are the products of the electrolytic action of the body fluids upon an electrode of zinc which has been previously amalgamated. At the positive pole, which is always used as the active pole, the acid ions, which appear there in a free state, attack the amalgamated zinc electrodes, forming oxychloride of zinc and mercury, both of which are highly astringent and germicidal salts. These nascent salts now travel away from the electrode to the interior and to all sides, along the path of current fluid, everywhere uniting with the albumin of the cells to form dead albuminates. This destructive action is not limited to the growth itself, but extends beyond it into the apparently healthy tissue, destroying the cancer proliferations without necessarily destroying the healthy tissue. This constitutes the zone of sterilization which Dr. Massey has described as a reddened and puffy area forming around the area of destruction during the first forty-eight hours following the treatment.

The fact that the current laden with the active mercury salts has such decided selective action upon malignant cells may be new to many of you, and to others still may seem impossible at first sight, and yet it is in accord with the most generally accepted scientific laws of both electricity and pathology. We know that the lines of current flow in the human body are always through the path of least resistance. If this be true, and it be also true that a neoplasm is a morbid proliferation of cells which have returned to the embryonal type, thereby rendering the tissues affected more cellular, of lower resistance

and vitality than the fully developed normal tissues, it becomes not only possible, but probable, that the current laden with the chemicals would flow through the cellular paths. Furthermore, we would expect the cancer cells to succumb more readily to the action of the diffused chemicals than the normal cells.

In practice we see clinical evidence of this selective action in every case when the zone of sterilization forms and shades off irregularly into the surrounding healthy tissue. This would indicate that in certain places a larger quantity of chemicals has been deposited, as evidenced by the greater reaction, and in tissues of identical structure this would be hard to account for unless we admit that the conductivity of those places has been increased by deposits of infected cells—that is, cancer cells.

ILLUSTRATIVE CASES.

The two lantern slides which I will show you presently are a faithful reproduction of the selective and, I may add, detecting action of the current on the malignant cells, as it was observed during the operation of two of my cases.



Fig. 1.

Fig. 1 is a photograph of a case of scirrhus of the breast taken about two weeks after the application. The nipple is seen distinctly surrounded by a circle of small holes representing the outer margin of the growth. These holes are the points through which the electrodes were thrust into the growth. The varying extent of massive diffusion of the mercuric salts

from the electrodes,—that is, from the small holes representing their situations, is very well illustrated. Also the marked lessened resistivity of the uppermost portion of the slough. The observation was also made that the diffusion took place much more rapidly inwards,—that is, towards the center of the disease,—than outwards into the apparently sound tissue, with the exception of the uppermost electrodes from which the diffusion took place about equally in both directions. Actual measurement on the photograph showed that the distance between certain holes and the periphery of the slough was three times greater than the distance between the latter and other holes.

Fig. 2 was made from a pen-and-ink drawing to illustrate what occurred during the treatment of a case of osteo-sarcoma.



Fig. 2.

of the cranial bones. It represents a half-section of the mouth. The dark portion shows the diseased part of the hard palate bulging into the mouth, also the disease completely enveloping the last molar tooth. This part of the growth is ulcerated. The wide area represents the area of massive infiltration—that is, the area of destruction. It will be seen that this involves all the diseased tissue, the gum surrounding the first molar, and extending to the mucous membrane of the cheek for over one inch and anterior pillar to the uvula. When the electrode was inserted into the center of the small ulcer over the last molar, I introduced my finger into the mouth between the gum and

cheek to protect the latter from any action. To my surprise, in about ten minutes I felt the mucous membrane of the cheek under my finger become warm, and examination showed that rapid diffusion was taking place in that situation. I continued to hold the cheek away from the gum and watched the process. The infiltration went on at about the same speed for a while until a strip of the mucous membrane of the cheek about one inch long had been changed to a grayish hue, with accompanying changes in temperature and consistence, then the speed rapidly lessened until the action practically ceased. Certainly a shorter and more direct path would have been to the gum of the adjoining last bicuspid tooth.

SUMMARY OF CASES.

The twelve cases treated by mercuric cataphoresis were unselected ones, as their histories will show. My aim in treating all cases which applied to me, was to acquire the necessary technique and experience, to thoroughly test the possibilities of the method, and to find out what palliation, if any, could be offered to those hopelessly inoperable patients, in whom the disease is so far advanced that nothing more than a very temporary palliation can be hoped for.

In justice to the method, when tabulating the results it is only fair to divide the cases into three classes: first, those that were operable; second, those that were inoperable, and third, those that were hopelessly inoperable.

TABLE I.

RESULTS IN 12 CASES OF CANCER TREATED BY MERCURIC CATAPHORESIS.

	Number Treated.	Cured.	Imp.	Palliated.	Failed	Died.
Operable	3	3
Inoperable	6	2	2*	1	1†	..
Hopelessly Inoperable .	3	1	1	1
Total	12	5	2	2	2	1

* One of these—Case 10—is still under treatment, and progressing so satisfactorily that I hope in a later report to be able to number him among the cases cured.

† In this case—No. 5—the major application which was indicated could not be employed.

TABLE II.

PARTS AFFECTED IN 12 CASES OF CANCER TREATED BY MERCURIC CATAPHORESIS.

Tongue, 3	Cervix uteri, 1	Eyelid, 1
Breast, 2	Genitals, 1	Cranial bone, 1
Neck, 2	Face, 1	

The head or neck was affected in seventy-five per cent. of the cases.

The disease was recurrent after some cutting operation in three inoperable cases. Radiotherapy had been employed in three cases, and all three were made worse by its use.

As the treatment had to be applied within the mouth in one-third of my cases, I tried to overcome some of the disadvantages of the ordinary style zinc points. For use in the two

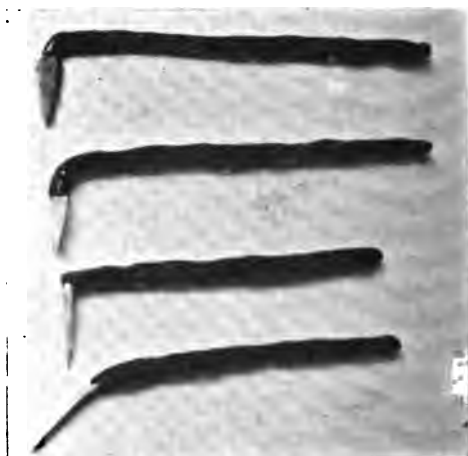


Fig. 3.

latter mouth cases, I constructed these four electrodes (Fig. 3.). They possess the following advantages over the zinc points employed at first, to wit: first, after being inserted into the diseased part, they can be kept in position more easily; second, two and even three can be employed at the same time (this was impossible with the ordinary point); third, except when inspecting the mouth or changing the electrodes, the mouth can be kept almost closed. This enables us to keep the patient more thoroughly under the influence of the anæsthetic, with a smaller quantity of the latter.

PART II.

HISTORIES OF CASES.

Case 1.—*Inoperable epithelioma of lower eyelid.—Cured.* Miss P. F., dressmaker, aged sixty. The disease started from a small ulcer near the inner canthus, and progressed slowly but steadily in its ulcerative course, until at the time of her first visit, it involved the inner four-fifths of the affected lid. The ulcer bled easily and often without apparent cause. Pain was present more or less throughout the progress of the case, becoming almost constant during the last months, compelling the patient to abandon her sewing. The lid was tight and drawn



Fig. 4.



Fig. 5.

and the movements of both the eye and lid were difficult and painful. The disease was completely eradicated by three minor applications of mercuric cataphoresis under local anæsthesia. This patient is now cured nearly one year.

Photograph 1A (Fig. 4) shows the condition at the time the treatment was begun. The inner four-fifths of the lower eyelid, together with the inner canthus and lachrymal sac, are involved. There is a deep, ugly ulcer in the center, and at both extremities of this, swollen and unhealthy tissues.

Photograph 1B (Fig. 5) shows the excavations after the diseased tissues had sloughed off, rapidly filling with healthy granulations.

Photograph 1C (Fig. 6) shows the lid healed, with practically no deformity, the movements of both the eye and lid are painless.



Fig. 6.

Photograph 1D (Fig. 7) shows the lid as it looks to-day, nearly a year since the treatment was instituted. Instead of the contraction and eversion of the lid feared by the ophthalmic



Fig. 7.

surgeon who saw the case with me, there seems to be more tissue in the lid, and the part looks better than it did four months ago when photograph 1C was taken.

Case 2.—*Epithelioma of the tongue.—Cured.*—Mr. A. H., aged twenty-four. The tumor, which was the size of a hazel nut, and slightly ulcerated, started five years before he was referred to me for treatment, as a small ulcer with an indurated base, caused by a projecting and jagged tooth. It increased slowly in size, becoming painful and swollen every few weeks, at which times it would bleed freely for several days, and when the hemorrhage was checked the swelling would subside. Last October he visited the surgical clinic of the Charity Hospital, where a small portion of the growth was removed for examination, and ligation of the external carotids advised. As he did not return to the clinic the report of the pathologist is not known, but the excision seemed to have stimulated the growth of the tumor. January 29, 1904, the patient was placed



Fig. 8.



Fig. 9.

under a general anæsthetic, and I made a major application of mercuric cataphoresis to the diseased portion of his tongue for one hour and fifteen minutes with a current averaging about 150 milliamperes. The destruction of all malignant tissues was complete, the resulting slough falling away on the tenth day after operation, leaving a wound which rapidly healed, and which remains healed and healthy to-day, seven months after the treatment was applied.

Photograph 2A (Fig. 8) was taken the day before the operation. It shows the hard, nodular, ulcerated growth, as large

as a hazel nut, on the right side of the tongue, about one inch from the tip. The nodules could be easily palpated through the dorsum of the tongue.

Photograph 2B (Fig. 9) shows the hole left in the tongue after the slough came away.

Photograph 2C (Fig. 10), taken about three months later, shows the wound healed. A small Y-shaped scar shows the site of the large hole seen in photograph 2B.

Photograph 2B (Fig. 11) shows the healed tongue as it looks to-day, more than seven months after the application.

Case 3.—*Inoperable recurrent carcinoma of neck.—Improved.*—Mr. F. H., aged forty-seven. Dr. A. C. King, who



Fig. 10.



Fig. 11.

referred the patient for treatment, stated that the resources of surgery and radiotherapy had been exhausted, and he hoped that mercuric cataphoresis would prove a palliative, by removing the pain and fetid discharge for a short time at least after each application. The growth had been excised five times, and from two weeks to two months after each cutting operation recurrence took place. It was then subjected to the influence of the X-ray, with decided improvement at first, followed by a period of quiescence of several months' duration, during which the disease was kept in abeyance, but no further improvement was noticed; later the raying proved positively harmful, and the treatment was discontinued. The mental suffering of the pa-

tient, caused by his appreciation of the hopelessness of his condition, and the profuse and offensive discharge which had forced him to abandon his occupation, was even greater than his physical suffering. The disease had made more progress during the last six months than during the preceding five years.

When the treatment was instituted, February 15, 1904, the disease extended from the external auditory meatus to within an inch of the clavicle, involving the lower portion of the external ear and the tissues of the neck. There was a large, deep ulcer below the ear, lying over the course of the vessels, and below this a mass about the size of a goose egg, which was



Fig. 12.



Fig. 13.

rapidly breaking down. The odor from the wound was nauseating and persistent. The patient was emaciated, and had a marked cachectic appearance. I made three major applications of mercuric cataphoresis under general anæsthesia within six weeks. The fetor disappeared during the first application and did not return during the subsequent course of the case. April 18th, about three weeks after the third operation, the slough had fallen out, leaving a clean, healthy, granulating wound extending from the external auditory meatus to within an inch of the clavicle (Fig. 13). This was rapidly filling up and healing. (Photograph 3C, (Fig 14) was taken only two weeks after Fig 13, to show the rapidity of the heal-

ing process.) The change in the general appearance of the patient was even more remarkable: he increased in weight, his cachectic look disappeared, he regained hope and his lost spirits, and expected to return to his work in a few weeks. About May 10th he began to suffer with a severe boring pain behind the ear and in the head; this pain was almost constant and especially severe at night-time. A day or so later he noticed a discharge from the external auditory meatus. He called at my office May 20th. The wound in the neck was



Fig. 14.

healed, with the exception of a spot the size of a twenty-five-cent piece, in the center of which was the external auditory meatus. The unhealthy granulations covering the spot were continuous, with similar granulations extending into the external auditory canal. Closer examination showed that the petrous and mastoid portions of the temporal bone were diseased and carious. The following day, May 21, the patient was given a general anæsthetic and a major application of mercuric cataphoresis was made to the affected tissues. The patient stood the anæsthetic and current well, and there were no symptoms of meningeal or cerebral irritation at any time during the application. Four hours after the application the pulse became bad and the breathing stertorous. This was followed by a steady rise in temperature, the patient dying six hours later with all the symptoms of basilar meningitis. His

existence for about three months had been rendered very comfortable, and the improvement, both local and general, had exceeded our most sanguine expectations.

Case 4.—*Inoperable recurrent carcinoma of the cervix-uteri.—Failure.*—Mrs. L. K., aged forty-six. February 12, 1904, I saw in consultation a patient upon whom an abdominal hysterectomy had been performed for a carcinoma of the cervix three months before. The disease had recurred within two months, and now a hard mass the size of a cocoanut could be felt in the pelvis, and on the left side in the vagina a cauliflower growth the size of a half-dollar. The patient complained of severe pains, there was an offensive and irritating vaginal discharge and marked œdema of the right leg. Micturation was frequent and painful.

As her physician and relatives were very anxious to have something done for her, no matter how small the chances of even a temporary benefit were, I consented to make the application. Accordingly the patient returned to the city March 1st for treatment, and was sent to a private sanitarium. Her condition was much worse, the pulse weak and very rapid, both extremities œdematous, and unmistakable evidences of internal metastasis were present. The vaginal discharge was profuse, and the odor so foul and penetrating that it could be detected all over the operating room. But the change in the local condition was simply bewildering. I have never seen such rapid growth. The small cauliflower growth which I had felt in the vagina only three weeks before now filled the vagina and presented at the vulva.

She was anæsthetized, and I made a major application of mercuric cataphoresis with a current strength of 500 ma. for twenty minutes and 800 ma. for twenty minutes longer. The pulse and respiration became so weak and rapid that the anæsthesia had to be discontinued. The odor disappeared entirely during the treatment and did not return for ten days afterward. The patient grew steadily and rapidly worse until her death, two months later. At that time the tumor was the size of a six-months' pregnancy.

Case 5.—*Epithelioma of tongue, floor of mouth, and lower maxilla.—Failure.*—Mr. H. M., aged sixty-one. The disease started in June, 1903, as an ulcerated nodule on the under surface of the right side of the tongue. Two months later, August,

1903, he consulted a physician, who made the diagnosis of epithelioma and recommended radiotherapy. This he began at once and continued for about four months. During the first six weeks of treatment by X-ray exposure, the improvement was very great, the pain and odor disappeared, and the tumor diminished in size; unfortunately the improvement did not continue, and later exposures seemed to aggravate the disease and accelerate its course. A week after the raying was discontinued his external carotid artery was ligated under local anæsthesia. When I saw him February 25, 1904, the tongue, floor of mouth, inferior maxilla, and glands were all involved. The involvement of the tongue and floor of mouth extended backward to the last molar. The odor and pain of a lancinating character were the most pronounced character. The patient was an alcoholic and an inveterate smoker, and his heart and arteries furnished unmistakable evidences of marked degenerate changes. This rendered him an undesirable and dangerous subject for a general anæsthetic, without which it is impossible to make a major application; and the extensive involvement, and the very malignant nature of the affection, placed him beyond the sphere of utility of the minor method.

Notwithstanding those objections, at the urgent solicitation of his relatives, I made three attempts to give him a general anæsthetic, employing on three different days ether, ether and nitrous oxide, and anæsthyl, each time with the result that as soon as the stage of surgical anæsthesia was reached, his condition would become so alarming that the anæsthesia had to be discontinued. With the hope of mitigating the pain and lessening the offensive discharge, I made three minor applications under local anæsthesia, but these proved so wearisome and painful that the patient discontinued the treatment.

Case 6.—*Carcinoma of the left breast and chest wall.*—*Died.*—Mrs. A. C., aged seventy-three. The patient was very weak and gave evidences of internal metastasis. The growth, which two years before was hardly the size of a marble, now measured six inches in width, involving the left breast and extending across the sternum to the right breast. It was ulcerated, and near the center was a hemorrhagic spot the size of a dollar, from which blood was oozing rather freely. Her relatives dreaded a repetition of the profuse hemorrhage from which she had nearly died thirteen months before, and realized that

in her weakened condition it would mean certain death. With the hope to check the oozing and to give the patient temporary palliation, I decided to make a major application of mercuric cataphoresis to the hemorrhagic spot. Accordingly, notwithstanding her very bad condition, she was etherized, and when reported doing well and in the surgical stage of anæsthesia, I inserted the zinc points and gradually turned on the current. Five minutes after the beginning of the application the pulse ceased to be felt, without any warning, the respirations continuing for a few moments longer. All efforts at resuscitation failed.

Case 7.—*Inoperable carcinoma of penis and genitals.*—*Cured.*—Mr. F. D., aged forty-two. The penile portion of the urethra had been completely destroyed by the disease. The urethral opening was situated at the bottom of an ugly ulcer as large as a dollar. The scrotum was œdematous, and in it, below, and around the ulcer mentioned above could be felt a hard mass the size of a goose egg. The characteristic odor and discharge were both present, and severe pain was a constant and distressing symptom. Although the patient gave no history of syphilitic infection, he had been placed for two years under an anti-syphilitic treatment without deriving any benefit.

April 2, 1904, I made a major application of mercuric cataphoresis under ether anæsthesia, for two hours, with an average current strength of 450 ma. The slough came away on the twelfth day and eradication seemed complete. Since the application he has been free from pain and foul discharge. To-day there is no evidence of disease, and the patient has greatly improved in general health.

Case 8.—*Immense inoperable recurrent sarcoma of the neck.*

—*Palliation.*—Mr. A. D., aged forty-six. September, 1903, the patient's attention was drawn to a small mass the size of a marble in his neck by occasional sharp, cutting pains. By January, 1904, this mass had grown to the size of a goose egg. He applied to a surgical clinic for treatment, and on the 14th of January the tumor was excised under general anæsthesia. Recurrence took place in the scar about three weeks later. Radiotherapy was then resorted to, but as it proved decidedly harmful, the treatment was discontinued after a few exposures.

When he applied to me for relief, April 4, 1904, the disease

involved the whole left side of the neck, extending from just below the left ear above to and over the clavicle below, and anteriorly from the side of the larynx and pharynx to within an inch of the spinous processes posteriorly. The lower portion of this large mass was breaking down rapidly, several sinuses having formed. From these came a profuse and nauseating discharge. The most prominent symptoms for which the patient sought relief were the pain, the increasing hoarseness, and sense of suffocating, all of which were more pronounced at night-time. The patient was a physical wreck. His previous history was that of a case of sexual neurasthenia of several years' standing. Two major applications of mercuric cataphoresis were made under general anæsthesia within a fortnight, and I only succeeded in destroying the anterior half of the disease. The failure to accomplish more, even after two major applications, was due to two causes: first, the very bad condition of the patient would not permit prolonged anæsthesia without severe shock; second, the inability to employ larger currents than 400 milliamperes, and even these could not be continued for more than a few minutes at a time without causing irritation of the cardiac branches of the left pneumogastric. The relief of the distressing pressure symptoms followed the application. The patient grew so weak, however, that no further treatment could be attempted, and the disease continued its rapid and destructive course until his death. The anterior portion which had been eradicated and sloughed away remained comparatively healthy, with relief of pressure symptoms, until about one month before death, causing a marked contrast with the surrounding malignant process.

Case 9.—*Scirrhus of the right breast.—Cured.*—Mrs. T., aged sixty-seven. The affection dated back six months, and was ushered in by occasional lancinating pains in the right breast. These became more frequent, and two months later a small ulcer formed near the nipple. The discharge from the ulcer was bloody and serous. Two surgeons who were consulted by the patient a few days before she applied to me for treatment advised immediate amputation of the breast and removal of the axillary glands. The scirrhus at that time was about the size of a hen's egg.

On April 25, 1904, the patient was anæsthetized, and I made a major application of massive mercuric cataphoresis for one

hour and fifteen minutes, with a current strength varying between 150 and 250 ma. The eradication was complete. The slough came away on the twentieth day after the application, leaving a clean, healthy wound which rapidly healed, remaining well to-day, four and a half months later.

Photograph 9A (Fig. 1), taken a week after the operation, shows the holes through which the zinc points were introduced into the margins of the growth, the area of destruction, surrounded by the area of sterilization, which shades off irregularly into the surrounding healthy tissue, and between the two especially noticeable below the line of demarcation.

Photograph 9B (Fig. 15), about one month after operation, we see the large granulating cavity left after the slough came away, surrounded by a border of newly formed epithelial tissue.



Fig. 15.



Fig. 16.

Photograph 9C (Fig. 16), one month later, the wound is not one-fourth the size that it was the previous month.

Photograph 9D (Fig. 17), still another month, the wound is healed.

Photograph 9E (Fig. 18), one month later than 9D and four months after the operation. The scar is narrower than in 9D.

Case 10.—*Inoperable epithelioma of the tongue, floor of mouth, submaxillary, sublingual, and cervical glands. Marked improvement.*—Mr. O. R., aged seventy-two. When first seen there was a large cauliflower growth involving fully three-quarters of the right lateral half of the tongue, the floor of

the mouth, the sublingual, submaxillary, and cervical glands. The mass on the tongue was very friable and bled easily, and from it emanated a strong offensive odor. Deglutition was painful and difficult. He complained of occasional sharp, lancinating pains in the tongue and mouth. The disease started two years before I saw him, as a small ulcerated spot the size



Fig. 17.



Fig. 18.

of a pea, situated on the right and under surface of the tongue, about one inch from the tip. During the first year it made little progress, but from that time the involvement and ulceration went on rapidly. The patient lost over thirty pounds in weight during the last six months. The excessive use of a pipe was the exciting cause.

The first application was made June 9, 1904, under general anæsthesia, for sixty minutes, with a current strength between 150 and 300 ma. The treatment was limited to the diseased tongue, because the floor of the mouth could not be well seen or treated. After the slough came away the diseased floor of the mouth was fully exposed, and it was also seen that the disease had not been completely eradicated from the posterior border of the semilunar wound left in the tongue.

A second application was made July 19, 1904. This time the diseased portion of the tongue and the apparently sound part adjoining it, were destroyed; the destruction extended to the circumvallate papillæ. An attempt was also made to eradicate

the entire disease, including the glands, in the floor of the mouth. This proved only partially successful, three small hard lumps, the largest about the size of a small pecan, remained in the bottom of the wound after the destroyed tissues sloughed out. This necessitated a third application, which was made August 12, 1904, with a current strength averaging 150 ma. for fifty minutes. The sloughs came away, leaving a clean healthy wound in the tongue and a clean excavation in the floor of the mouth, free from disease, with the exception of a small nodule the size of a pea situated beneath the tip of the tongue. At the end of two weeks the nodule was the same size, and no other diseased tissue could be detected.

September 6, 1904, I made the fourth application. The diseased nodule under the tongue was treated for twenty-one minutes, and the cervical glands, which had become enlarged since the first treatment, were also treated for about one hour. I believe that I have succeeded in thoroughly eradicating the disease from the tongue and mouth, and hope that the cervical glands will not require another application.

Since the first application the patient has been free from pain and offensive discharge. His weight and appetite have increased. He has regained hope and his lost spirits, and altogether the improvement in his general condition has kept pace with the local improvement, notwithstanding that at his advanced age he was kept under a general anæsthetic for two hours or more four times during the last three months, and these our hottest months.

Case 11.—*Epithelioma of the right cheek.—Cured.*—Mrs. C., aged sixty-five. On examination I found an ulcer as large as a dime, with very much indurated base and borders. The patient stated that the affection began about one year before as a tiny ulcer, which resisted the ordinary washes and salves. When it reached the size already mentioned and became indurated she sought the advice of her physician, who diagnosed her condition and referred her to me.

The disease was eradicated by two minor applications of mercuric cataphoresis, under local anæsthesia. The slough had separated and the wound was healed within three weeks. The resulting scar is almost linear.

Case 12.—*Osteo-sarcoma of the cranial bones.—Palliation.*—Miss L. L., aged forty-two. The disease involved the palate,

ing process.) The change in the general appearance of the patient was even more remarkable: he increased in weight, his cachectic look disappeared, he regained hope and his lost spirits, and expected to return to his work in a few weeks. About May 10th he began to suffer with a severe boring pain behind the ear and in the head; this pain was almost constant and especially severe at night-time. A day or so later he noticed a discharge from the external auditory meatus. He called at my office May 20th. The wound in the neck was



Fig. 14.

healed, with the exception of a spot the size of a twenty-five-cent piece, in the center of which was the external auditory meatus. The unhealthy granulations covering the spot were continuous, with similar granulations extending into the external auditory canal. Closer examination showed that the petrous and mastoid portions of the temporal bone were diseased and carious. The following day, May 21, the patient was given a general anæsthetic and a major application of mercuric cataphoresis was made to the affected tissues. The patient stood the anæsthetic and current well, and there were no symptoms of meningeal or cerebral irritation at any time during the application. Four hours after the application the pulse became bad and the breathing stertorous. This was followed by a steady rise in temperature, the patient dying six hours later with all the symptoms of basilar meningitis. His

of the tumor had been reached by the cataphoric particles by noting the appearance of the grayish hue.

Photograph 12A (Fig. 19), taken a few days after the treatment, shows the area of destruction; also the diseased tissue treated per orem.

For about one month after the application the patient continued to have unbearable pains in the vertex of the orbit. Her condition the day before I left New Orleans was as follows: She complained of little or no pain and could breathe and swallow without pain or difficulty. The sight in the left eye was lost, there was left facial paralysis, a hard tender swelling on the bridge of the nose and around the left orbit; the left eyelid was closed, swollen, and painful on pressure. On the median line in the roof of the mouth there was a cyanotic mass about as large as the original lump in that situation; the remainder of the wound left after the slough shown in Fig. 19 came away was healed.



A CASE OF FIBROMYXOSARCOMA OF THE
SACRUM OF LARGE SIZE, SUCCESSFULLY
TREATED BY CATAPHORIC OPERATIONS, WITH
PRESERVATION OF THE SPHINCTER.*

BY G. BETTON MASSEY, M. D., PHILADELPHIA.

Mrs. C. A., aged 26, the mother of a baby aged 18 months, came to me from Royersford, Pa., in October, 1903. Mrs. A. had a history of two difficult childbirths several years before with instrumental delivery and death of the children, but the last confinement had been normal.

In the spring of 1903 a tumor was discovered in the pelvis. After some delays she consulted a surgeon connected with the Hahnemann Hospital in this city, and on September 6, he performed an abdominal section and found that the tumor was attached to the sacrum. The abdominal incision was closed, and an unfavorable prognosis given.

The patient then went to Dr. W. W. Keen, of Philadelphia, who is reported to have concurred in the diagnosis of sarcoma, and to have said that an operation for its removal would be dangerous and would probably result in paralysis.

On examination a hard growth was found in the posterior portion of the pelvis. With the examining finger in the rectum this growth was ascertained to be posterior to the rectum and attached to the inner surface of the sacrum by a broad base. It was about the size of two fists, and nearly filled the pelvis, the lower border curving back to the sacrum at a point about two inches from the anus. The upper edge could not be reached by the finger.

As the tumor was growing rapidly, it was decided that a desperate effort should be made to destroy it by the massive dissemination of mercuric ions with a strong electric current, under general anæsthesia. The necessary batteries were accordingly taken to her home, and the kind services of the family physician, Dr. James C. Mewhinney, of Spring City, were enlisted.

The application was made on October 5, at Royersford, with

* Read before the Philadelphia County Medical Society, June 22, 1904.

the assistance of Drs. Mewhinney and J. Elmer Porter, of Pottstown, whose effective help I am glad to acknowledge. After the patient was anæsthetized and placed on a specially prepared negative pad on a cot, in the Sims' position, the skin over the upper portion of the coccyx was incised to admit a

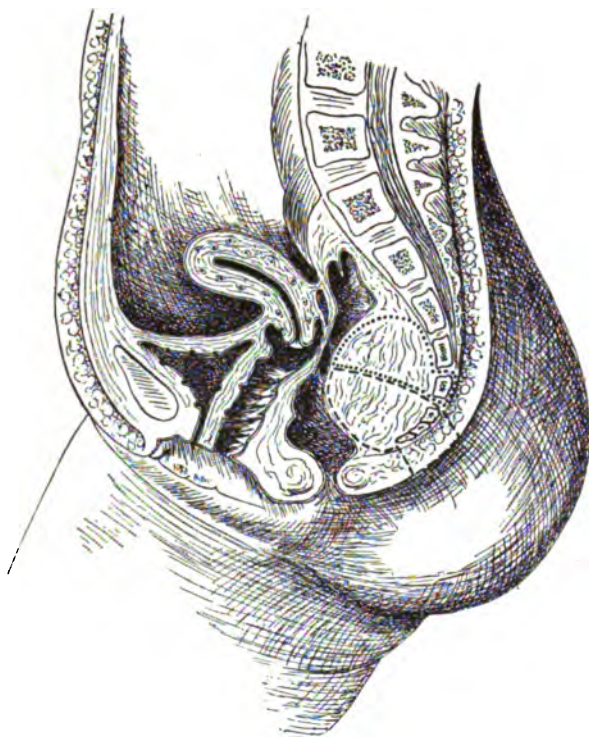


Fig. 1.—Diagram of median section of pelvis and tumor. The portion destroyed by the first operation is inclosed by a broken line, and includes the last three bones of the coccyx. The remainder of the tumor, including the first segment of the coccyx, was destroyed by the second operation, and is indicated by a dotted line.

sharp-pointed zinc-mercury electrode somewhat larger than a lead pencil, the unusual thickness of the electrode being arranged to prevent breakage when softened with mercury. Through the slit thus made in the skin the electrode was forcibly thrust into the still healthy tissues surrounding the coccyx, and directed upward into the middle of the growth by a finger in the rectum. This route through the healthy

tissues above the anus was selected to avoid interference with the anal sphincter, and also because it was anticipated, as it subsequently occurred, that the slough would be too large to come away through an intact anus. A powerful current was then slowly turned on; this quickly developed the ionized chemicals by electrolytic destruction of the anode, and dispersed them radially from the electrode, necrosing and sterilizing an increasing area of skin, subcutaneous tissue and malignant tissue surrounding the electrode. The current was gradually raised to 1600 milliamperes, after two other electrodes of smaller size had been inserted alongside the first, and

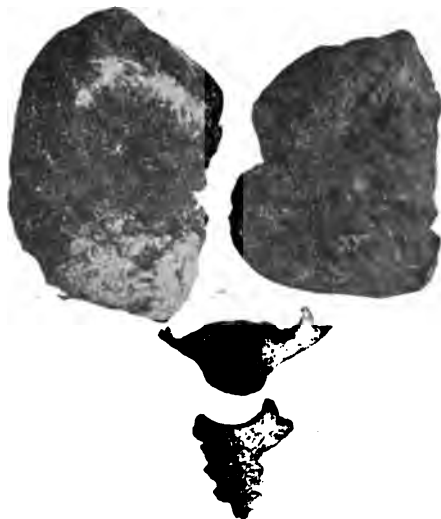


Fig. 2.—The two pieces of devitalized sarcoma tissue and the bones of the coccyx, as they appeared after separation (reduced to one-fourth size).

was allowed to flow steadily for three hours, when it was turned off and the patient placed in bed.

The conditions present after the application were as follows: A round, grayish-colored area of devitalized and sterilized skin, subcutaneous tissue and sarcoma tissue had been produced with a diameter of about three inches, extending deeply into the growth. The growth itself had become shrunken and softer, as ascertained by the rectal touch.

Owing to faulty arrangement of the negative pad, the patient had several bad skin burns on different portions of the



Fig. 3.—Scar 7½ months after cataphoric destruction of sarcoma of sacrum (full size). *A*, sinus leading into rectum; *B*, anus. The sinus has become still smaller since this photograph was taken.

trunk, and these gave her more discomfort during the time she remained in bed than the area treated.

Two weeks after the application there was a sharp secondary hemorrhage from the wound, which was readily controlled by pressure.

On the twenty-first day after the operation three of the bones of the coccyx and about half of the tumor came away bloodlessly.

In the diagram of a median section of the tumor and pelvis shown in Fig. 1, the portion that separated at this time is inclosed by a broken line.

Through the three-inch wide opening thus made it was seen that the whole growth had not been destroyed, a red mass showing plainly at the bottom of the sinus. The finger in the rectum could now be hooked over the top of the remaining portion of the growth. The posterior wall of the rectum had been destroyed, and all fecal movements passed through the wound.

The patient's condition was so fair that a second and what proved to be a final application was made one month after the first, or on November 4, 1903. At this time 1200 milliamperes were turned on and maintained for two hours. Sixteen days later the remainder of the mass came away, somewhat larger than a man's fist, and three days later the detached, devitalized first segment of the coccyx was lifted out of the wound. (Fig. 2.)

During December efforts were made to direct the fecal discharges through the natural anal opening, about an inch below the wound, by inserting hard-rubber tubes of various sizes through the anus to keep it patulous, but the tubes failed to maintain an opening with a proper curve to intercept the dejecta and were finally abandoned, the fecal discharges continuing to pass through the wound until its gradual narrowing, late in the winter, diverted the fæces into the natural channel through the anus.

The patient sat up in the second week of December, went downstairs on Christmas day, and walked out January 10. On January 13 she had the first natural movement through the anus.

At the present time, more than seven months after the last application, the patient, whom I present to you this evening,

is in unusually good health, with no evidence of fullness or growth of any kind in the pelvis or elsewhere. She walks and sits easily, and the opening is so small as to scarcely admit a small pea (Fig. 3); it is believed that it will ultimately close entirely.

At the time of the second application a small portion of the growth was removed and sent to the Philadelphia Clinical Laboratory for histologic examination. The report characterized the growth as a fibromyxosarcoma.

[NOTE.—At time of publication, nearly one year after the first application, the patient continues well and free from return of the sarcoma. The opening will about admit a Simpson sound.]



RADIOGRAPHY.*

BY HERMAN GRAD, M. D., NEW YORK.

NATURE OF THE X-RAY.

When an X-ray tube is in action certain phenomena are observed. If a low tube is employed for observation, a stream of violet light is seen passing from the cathode to the anode. These rays have been termed cathode rays. The cathode rays are supposed to consist of particles of matter in the tube, and as the matter is in a state of extreme attenuation, they have plenty of room to move about and travel with great rapidity. As the tube gets higher the particles of matter in the tube have still more room to move about and another phenomenon is observable. That part of the glass bulb of the tube which is in front of the anode begins to fluoresce, and the radiance fills the bulb of the tube. These phenomena have been known to the scientific world for many, many years, but it remained for Roentgen to discover that certain effects are produced by such a tube, capable of causing fluorescence in other substances outside of the tube. Not alone does the glass of which the bulb is made fluoresce, but other substances, notably platino-cyanide of barium spread on a piece of cardboard, also fluoresce when brought in the vicinity of the tube, the phenomena of fluorescence being still visible three or four feet away from the tube. Furthermore, the fluorescence goes on, whether the cardboard side is turned towards the tube, or that side upon which is spread the fluorescent substance. It is evident, therefore, that the energy or matter that comes away from the Crookes tube is capable of penetrating cardboard. Again, if the tube is covered entirely with black paper, which is impervious to sun or artificial light, it will not interfere with the fluorescence of platino-barium cyanide. Believing that this was a form of a ray, Roentgen called it an X-ray. That this ray is not the cathode ray has been proven experimentally. Cathode rays are deflected by a magnet, but the X-rays cannot be deflected by any known means. Roentgen

* Advanced sheets of the chapter on Radiography and Radiotherapy to appear in "Conservative Gynecology," by G. Betton Massey, to be published by F. A. Davis Co., Philadelphia, Pa.

believes that the X-rays are longitudinal vibrations of ether of extremely small wave lengths. These rays penetrate paper, wood, leather, glass, and even thin sheets of tinfoil. Lead is quite opaque to the X-rays. The human flesh admits the rays to pass readily, but the osseous structure throws a decided shadow on the fluoroscopic screen. It is this phenomenon of the X-ray that interests the medical world, and has become so useful in the diagnosis of foreign bodies, fractures, dislocations, and various other conditions.

Roentgen made the observation, also, that sensitized plates are affected by the X-rays, the same as by other light, and discovered further, that it is not the fluorescence that causes the changes in the plate, but the X-rays proper. The tube can be wrapped in sun-proof paper, yet the photographic plate will be affected, even three or four feet away from the tube. In fact, plates become fogged when kept in the same room where the Roentgen tube is in action.

While it is admitted that the source of the X-rays is the cathode rays, emanating from the negative or cathode pole of the tube, Roentgen maintains that the X-rays are developed at the point where the cathode rays impinge on the side of the wall of the tube, or on the anticathode; that when the particles of matter flying off from the cathode with extreme velocity strike an object in the tube, a new ray is produced which has the peculiar property of penetrating objects opaque to ordinary light. In the original Crookes tube the X-rays were produced at the point where the cathode rays struck the glass wall of the tube. It was soon found that if the tube remained in action for some time the glass side of the tube became hot from the bombardment of the particles of the cathode ray stream against it. After a while the glass would soften, and atmospheric pressure puncture the tube. As the cathode rays travel in straight lines, the anode of the tube, made of platinum, was placed in the center of the tube, to be the target for the cathode rays, thereby sparing the glass from frequent punctures. This latter device was of extreme importance, because, whereas in the original Crookes tubes, the X-rays were given off from the entire tube, wherever cathode rays impinged; now, the X-rays emanate only from the target, thus concentrating the rays materially.

This very important advance was made by Mr. Herbert

Jackson of England, making the X-ray tube a proficient instrument, by placing the anode in the center of the tube, and making the cathode a concave disc, instead of a flat surface, the concave cathode disc having the effect of focusing the cathode rays. The anticathode (anode) is placed at an angle of nearly 45° . The anode should be made of platinum, in order to withstand the tremendous heat which is developed at this point. The X-rays emanate, diverging from this point in all directions, opposite the plane of the anode. The entire field of radiation is not of the same intensity. The rays of greatest intensity are about perpendicular to the plane of the anode. The divergence of the rays is responsible for the fact that in taking X-ray pictures, if the plate is brought too near the tube, it will cause enlargement of the object skiagraphed. To avoid such a distortion it is necessary to have the plate about twenty inches from the anode of the tube. At this distance, the rays begin to be a little more parallel, the angle of the divergence of the rays being not so great at that distance.

FLUOROSCOPY.

The fluoroscope has proven of great service in medicine, from a diagnostic point of view. In locating foreign bodies it is at times superior in value to the photographic plate. In examining, for example, for a foreign body in the esophagus, the fluoroscope cannot be replaced by the plate. In fact, in chest examinations, this instrument finds its greatest field of usefulness. In this region of the body, the examination of the various organs in motion will lend considerable knowledge. One must, of course, be thoroughly familiar with the physiological fluoroscopic appearance of this region of the body before the pathological can be appreciated. In the chest, the clavicle, the scapula, the ribs, the heart, the sternum, the vertebræ, the large blood vessels, all throw their distinctive shadows on the fluoroscopic screen. These shadows necessarily vary in their outline and form, according as they are viewed from different angles. A side view will differ from that in front or back. These shadows will also differ in different individuals. The lung tissue admits the X-rays very readily, and any deviation from this transparency points to congestion, infiltration, or some other pathological changes in the lung tissues. The fluoroscope will find a useful field in the diagnosis of incipient

tuberculosis. The position of the heart admits of being outlined with the fluoroscope, and the size of the shadow will assist in determining the degree of its hypertrophy or dilatation. The extent of the shadow of the aorta and large blood vessels in this region will determine the presence of an aneurism. The fluoroscope has been pressed into service to locate the gangrenous areas in the lung tissue with much success. It is difficult to appreciate what it means, both to the patient and surgeon, to be able to locate these areas with precision. It becomes a comparatively small matter to drain an area in the lung tissue, if the abscess or gangrenous spot can be located. On physical examination, alone, one cannot rely positively for the localization of these pathological areas. Palpation, percussion, and auscultation cannot be compared in value to the information that sight will give. True, with the fluoroscope we only see a shadow, but location of these shadows is all we need. Pleuritic effusions, and pus collections can be seen with the fluoroscope with surprising clearness. Foreign bodies in any part of the chest can be located, and their extraction need not become so hazardous an operation under the guidance of the fluoroscope. In searching for foreign bodies, the plate should also be pressed into service. By taking skiagraphs in various angles, the location of the foreign body can be determined more accurately. The same is true of foreign bodies in the abdominal cavity. Foreign bodies in the stomach and intestines, such as buttons and pins swallowed, can be located with the fluoroscope, and their progress through the intestines watched; or, if arrested, their location noted, making the extraction by the surgeon a comparatively simple matter. It is no small comfort for the surgeon to watch his Murphy button coursing through the gut tube.

Quite characteristic is the fluoroscopic picture of the upper abdominal region. The liver, spleen, kidneys, and, partly the pancreas, give shadows, the form and outline of which should be studied under physiological states. The up-and-down motion of these organs, with each act of respiration, is not without interest. During pathological states, these rhythmic excursions of the organs of this region are disturbed, and we may be assisted by the fluoroscope in establishing a diagnosis. Disease of this region of the body, a space scarcely larger than the palm of a hand, offers considerable difficulty in diagnosis,

and, if the fluoroscope and plate promise yet so little in clearing up a diagnosis, it surely deserves recognition.

The large abdominal blood vessels and vertebræ cast, also, their distinctive shadows on the fluoroscopic screen, and aneurismal enlargements may thus be studied with the fluoroscope. The fluoroscope is of great service in diagnosing affections of the joints, and here, in some respects, it will give more valuable information than the plate itself, because the joint can be examined in its various motions, particularly in dealing with foreign bodies in these cavities. In fractures and dislocations in this region, as well as in others, the plate will give more accurate information. A fluoroscopic examination of a fracture, while it may give valuable information, will never compete with the information that a photographic plate offers, and furthermore, a plate remains a permanent record; a consideration of no slight importance, when treatment is to be instituted. If displacement of fragments exists, with a radiograph at hand, their proper reposition is greatly facilitated. In fracture cases, when the splints are in position, or plaster cast applied, the fluoroscopic examination will show the success of the efforts at reposition.

Before dismissing the subject of fluoroscopy, a note of warning should be given to the operator not to neglect to note the time of exposure, lest he expose the subject too long and unintentionally set up an X-ray dermatitis. By noting the time he is not so apt to overexpose his subject.

SKIAGRAPHY.

Our knowledge of bone injuries has been immensely enlarged since the discovery of the X-rays, and this can readily be understood to have occurred when we consider the fact that to the sense of touch has been added the sense of sight, in dealing with bone injuries. We are able, with the aid of these rays, to actually see the damage inflicted. Necessarily, not alone the diagnosis, but the method of treatment, has been vastly enriched by the X-rays. A properly executed skiagraph, taken at a proper angle, will lend a wealth of information about the bone injury. It will show the fracture clearly; it will give precise information of the position of the fragments of the displacement, and to what extent the fragments themselves

have been damaged. A simple fracture of bone is amenable to a treatment which requires the observance of only one essential point, viz.: immobilization. Not so, however, with a fracture where bone has been crushed, where the fragments have become displaced, and possibly pieces of bone chipped off. Here, immobilization alone will not suffice. Proper reduction, followed by immobilization, is necessary. It is in these serious and complicated conditions of injury that the Roentgen rays illuminate so brilliantly the pathological field. Here, most complicated manipulations will be called for to remedy the prevailing state of conditions. Intelligent and carefully executed reposition of fragments, correction of displacement and deformity, is only possible under the leadership of the Roentgen rays—a light that shows the heretofore invisible, and points out the heretofore unknowable. In these complicated injuries the fluoroscope should be pressed into service, and the examinations made in the various planes, so as to become acquainted with the entire field of injury. Only in this manner can a mental picture of the entire injury be obtained. In taking an X-ray picture the skiagraph will only show a shadow of one plane of the object. While some fractures will show up well in one picture alone, if the proper plane is caught, it is not advisable to rely upon one skiagraph in all cases. Each fracture should be skiagraphed in at least two planes, if possible, one at right angles to the other. Indeed, in some bone injuries, it may be necessary to skiagraph in three or four different planes, before the proper extent of the injury can be elucidated. In some regions, like the shoulder, for example, it is not possible to skiagraph so that one plane should be at right angles to the other, because the body will not permit such a position. Under these conditions an anterior and a posterior plane can be taken, or else one picture taken at an acute angle. Indeed, a fracture of the surgical neck of the humerus, a picture taken at an acute angle with the plate resting on the scapular region, and the tube in front of the patient at an acute angle to the plate, will show markedly the usual displacement of the upper fragments. It will show the displacement somewhat exaggerated, but the picture will give one an excellent idea of how best to reduce the displacement. In these complicated fractures the reposition, if possible, should be done under the guidance of the fluoroscope. Particularly is this method of reposition to be

advocated when fractures involve structures that enter into the formation of a joint. Displacement of fragments that would be of little significance in other parts of the body, and would not cause impairment in function in the joint, these same displacements and want of coaptation may turn out to be potent agents in causing serious functional derangement. The ingenuity of the operator will be taxed quite frequently as to what plane of the fracture to depict on the plate, to show up the fracture to the best advantage. This can best be discovered by making a thorough fluoroscopic examination before deciding on the plane for the skiagraph. In certain injuries it would be impossible to do this. Under these conditions we must rely wholly on the skiagraph alone. For example, in injuries of the hips a fluoroscopic examination can scarcely be carried out. In injuries of this nature, a skiagraph taken with the patient lying on the back, and a second one with the patient on the abdomen, will give us all the data necessary for a diagnosis, and the study of these two pictures will suggest other modifications in the position, should such change be necessary.

In severe and complicated fractures, it is a wise procedure to obtain a skiagraph of the normal or sound side. By doing this we have a plate of the normal X-ray appearance, and it will serve excellently for comparison with the injured or pathological side. Indeed, in medico-legal cases this should not be neglected, because in this way, even the uninitiated can be made to understand the difference between the two negatives.

TECHNIQUE OF SKIAGRAPHY.

In taking a radiograph, the subject, the tube and plate must be in a certain relation. The part to be taken must rest against the film side of the plate and between the plate and X-ray tube. As our source of the light is from the anode of the Crookes tube, we should place the anode parallel to the plate, so that the surface of the latter should receive an equal quantity of rays. The whole surface of the plate, as it were, should be bathed in the rays coming from the anode. The region that is to be the point of particular search should be opposite the center of the plate, and an imaginary line drawn from the center of the anode should pass through the center of the sensitized plate. The distance of the anode of the tube

from the plate should be about twenty inches. In this space of twenty inches should be placed the part to be exposed. In making a shadowgraph of the chest and abdomen, the distance of the anode from the parts will have to be increased, as in some subjects the diameter of these plates will be almost twenty inches. Under such conditions, the tube should be set about eight or ten inches from the skin of the subject. It is very essential to make the patient as comfortable as possible during the exposure, as otherwise he will not be able to keep the part quiet long enough to obtain a satisfactory picture. Particularly is this the case when X-ray pictures are taken with the static machine. The exposures are then very much longer than with the powerful induction coil. The degree of the vacuum of the tube should be determined before an X-ray picture is to be made. If the bones of the hand show up partly black, the tube is low enough for radiography. In fact, if two or more pictures are to be taken with the same tube, and the coil is used, before each one of the exposures the tube should be tested. The tube in good condition, the patient and plate in proper position, the current is turned on, and the proper exposure made.

TIME OF EXPOSURE.

The length of time required for exposure in order to obtain a good skiagraph will naturally vary materially with the region to be skiagraphed, and with the subject under consideration. The shoulder of one subject may require less exposure than the elbow of another. It is the amount of tissue, adipose or otherwise, that the rays have to penetrate that must be taken into consideration. The capacity of the machine, with which the operator is working must also be recognized. For example, an induction coil, the primary core of which will take thirty amperes, with a good working tube, will generate a volume of X-rays far above that of one with only a capacity of twelve amperes. The length of time of the exposure in the latter case must necessarily be increased, in order to get a radiograph of the same density and clearness as in the first instance. The vacuum of the tube, also, being such a variable entity, is a factor that must be dealt with constantly. Some tubes with a coil of less capacity will do better work than another tube of

less efficiency, but attached to a machine of a larger capacity. The volume of current that the tube can use up, so to say, is the factor that determines the resulting richness of X-rays. With an induction coil of say fifteen amperes capacity, and a good working tube, the time of exposure of the various regions of the body should conform to the following table:

Hand.....	5-10 seconds.
Elbow.....	10-15 "
Shoulder.....	30-40 "
Chest.....	30-40 "
Neck.....	15-20 "
Head.....	60-70 "
Hip.....	90-120 "
Thigh.....	40-50 "
Ankle.....	20-30 "
Foot.....	20-30 "

If a static machine is used to excite the tube, the length of time of exposure should be the following:

Hand.....	3-4 minutes.
Elbow.....	6-7 "
Shoulder.....	10-12 "
Chest.....	15-20 "
Neck.....	10-15 "
Thigh.....	10-12 "
Ankle.....	8-10 "
Foot.....	8-10 "

The plate, having been properly exposed, will be ready for the developing solution. It should be at once removed, the current having been turned off, so that no further X-rays can reach it. It should be protected from heat and moisture, as well as strong lights.

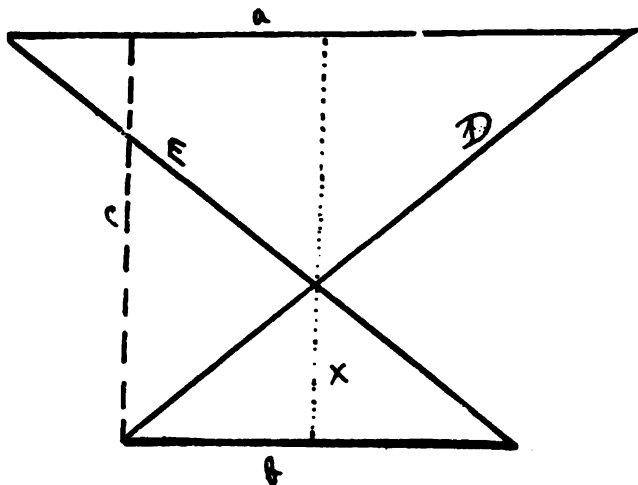
FOREIGN BODIES.

The location of foreign bodies by means of the X-ray is at times a simple process, but at other times it may be exceedingly difficult. Only those foreign bodies which cast a shadow will admit of being located by the Roentgen rays. Foreign bodies swallowed by children, or accidentally by adults, can be located fluoroscopically quite readily. Their removal, however, will not be so easy a task. Foreign bodies in the esophagus and other parts of the gastro-intestinal tract will show up very readily with the fluoroscope, and their location can be studied by this means. As a rule, these cases will require specially constructed instruments for their removal. Under the guidance of the

X-rays the removal of these foreign bodies with these special instruments will readily be accomplished. The greatest difficulty will be encountered with foreign bodies in the larynx, trachea, and bronchus, but even from these locations the efforts at removal have been crowned with success under the X-ray. Foreign bodies, arrested in the stomach and intestines, will call for surgical measures for their removal, but even here the fluoroscope will give the operator valuable data of the location and position of the offending body. Quite another problem arises with foreign bodies in the tissues—such as bullet wounds, or other missiles. Here the localization of the missile becomes an important matter. Take, for example, a bullet that has entered the arm. A skiagraph will show the foreign body by means of a shadow. The question now is, what is the exact location of this body? Is it one inch or more from the surface? Does it rest on the bone, or is it merely under the skin? There are a great number of methods advised for localization of foreign bodies in the limbs, but the simplest one is the following: Let us imagine that we are dealing with a bullet wound in the thigh. With the fluoroscope, we determine the horizontal and vertical plane of the bullet. These two planes are marked on the skin of the thigh with iodine or silver nitrate. With a piece of adhesive plaster four letters made of wire are pasted on the skin at the ends of two imaginary lines passing through the limb in the planes mapped out previously with the fluoroscope. We shall have, then, the wire letter A anteriorly, the letter B posteriorly, and C and D to the right and left of the imaginary line. The limb is now skiagraphed, and the distance of the shadow of the four wire letters from the shadow of the bullet on the X-ray plate will indicate the position and location of the foreign body in the limb. This method of localization, as a rule, will give the surgeon a good idea of the location of the bullet, and he will avoid making unnecessary incisions in search for the offending missile. In foreign bodies of the hand, such as pieces of needle or pin, the following simple method of localization will, as a rule, be sufficient. The hand of the patient is held against the fluoroscope, the operator fixes his eye on the foreign body and moves the fluoroscope and hand of the patient to right and left in front of the X-ray tube. In doing this, careful observation will show that the shadow furthest away from the eye of the observer will move

more rapidly across the fluoroscopic field. If the palm of the hand is pressed against the fluoroscope and the needle is lodged between the bone and back of the hand, then, by gently moving the hand to right and left, the shadow of the needle will be found moving across the field of vision with more rapidity than the shadow of the bone in front of it, and vice versa, if the needle is in front of the bone. To verify this, a very simple experiment will suffice. Fasten a needle to the back of the left hand with a piece of adhesive plaster. Stand in front of the X-ray tube and press the palm of the hand against the back of the fluoroscope. It will be seen, on moving the hand, that the shadow of the needle crosses the field of vision much faster than the shadow of the phalangeal bones. Reverse your hand, and the phalangeal bones will travel across the fluoroscope more rapidly. The horizontal plane is then marked out with silver nitrate or iodine. These data will give much valuable information to the surgeon in removing the foreign body.

In foreign bodies of the chest cavity, the problem of localization can be attacked in the following way, utilizing well-known algebraic formula :



If two lines are drawn between two parallel lines so as to cross each other, two triangles will be formed, the angles of which are the same. If a line be drawn through the angles, the parts of this line intercepted by the triangles will bear the same

relation to each other as the parallel lines between which the triangles are formed. The equation will now be as follows:

$$\begin{aligned} a : b &:: c - x : x \\ ax &= bc - bx \\ ax + bx &= bc \\ \frac{x}{a + b} &= \frac{bc}{a + b} \end{aligned}$$

If $a=6$ $b=2$ $c=12$ then $x=3$

$$x = \frac{bc}{a + b} = \frac{(2)(12)}{6 + 2} = 3$$

It can readily be seen that if the value of three lines are known, the fourth can be found. The three measurements necessary are the lines, a , b , c , and their value, by way of illustration, is found in the following way: Take a large book, like a Polk's directory or a U. S. Pharmacopeia. Place a coin into any part of the book. Place the book over a sensitive plate, and make the exposure so that an imaginary line, drawn from the center of the anode of the tube, should pass obliquely through the book. The distance of the anode from the photographic plate in a straight line should be measured and recorded. Let us say that this distance is eighteen inches. This known quantity corresponds to the line c in the above drawing. The oblique line of rays from the anode, above spoken of, represents the line D in the drawing. Now, an exposure is made long enough to give a good shadow of the coin on the plate. This having been completed, the book and plate should retain their position, and the tube is moved to the other side of the plate in the same horizontal position, so that an imaginary line from the center of the anode should again pass obliquely through the book. This line of rays will correspond to the line of E in the drawing. The distance between the first and second positions of the tube should now be measured and noted. Say it was ten inches, this known quantity gives us the length of the line a in our drawing. The plate is again exposed for a sufficient length of time. It is very evident, from what has been said, that as a result of these two positions of the tube, the rays will cross each other, the same as the two lines D and E cross each other in the drawing. When the plate is developed, it will be seen that the coin has two shadows on the plate. The distance between these shadows on the plate is now measured. Let us say that this distance is two inches. Our equation runs then as follows:

The distance of the tube from plate... 18 inches.
 " " between the two positions of the tube... 10 "
 " " " " shadows on the plate... 2 "

The three measurements being known the fourth is easily found.

$$x = \frac{b \times c}{a + b} = \frac{2 \times 18}{6 + 2} = 4\frac{1}{2}$$

The coin, then, in the book is 4 1-2 inches from the surface where the plate was situated during the exposure. A book, however, has three dimensions; hence the position of the coin in all of the three planes must be located. The three measurements thus obtained will give exactly the location of the coin. With foreign bodies in the chest the same method may be used. Here, however, only one picture is really necessary to find out the depth of the bullet from the surface. The horizontal and vertical planes in which the foreign body is lodged can be found with the fluoroscope alone.



Editorial.

THE THIRTEENTH ANNUAL MEETING OF THE AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION.

The meeting of the Association held at St. Louis on the 13th, 14th, 15th, and 16th of September, was noted for the large attendance of Western members, and the large addition to the present membership of the Association demonstrating the importance of holding frequent sessions of the Association at Western points. As a National organization, the membership should comprise physicians from all parts of the country, and a spirit of fairness will lead to the holding of frequent sessions west of the center of population hereafter.

The papers presented were of unusual interest, and indicated the marked progress in the field to which the Association is devoted.

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THE INTERNATIONAL ELECTRICAL CONGRESS.

The first International Congress of Electricity held in this country in which electro-therapeutics was included, was held at St. Louis during the same week as the meeting of the American Electro-Therapeutic Association, and afforded those interested in this great and growing field a splendid opportunity of hearing and discussing the papers which were presented at this meeting.

The conflicting hours at which the meeting of the American Electro-Therapeutic Association was held had a tendency to divide the attendance between two sessions. As far as possible, however, adjournments were made, and the programme rearranged to enable members to attend both sessions, and the meeting was in its general features a great success.

The joint sessions of the Electro-Therapeutic Association and the Congress held on Thursday, September 15, was a meeting which will long be remembered, the session not closing for refreshments until 3 P. M.

THE STATUS OF MECHANICAL VIBRATION IN THERAPEUTICS.

Mechanical vibration, which properly includes two forms of application—spinal stimulation and vibra-massage—has established an important place in therapeutics, which it is certain to fill to the advantage of suffering humanity. That it can, however, fill the place which the narrow osteopathic notion would give it in therapeutics, is too absurd to contemplate, and those who would underrate the value of other physical therapeutic measures in comparison with mechanical vibration, belong to the school of thought in which small minds, confining themselves to small circles, fail to comprehend the great scope of a comprehensive use of different measures to meet different indications. If comparisons were to be drawn, mechanical vibration, while filling a valued field, could never cope in its extent of application with the use of the different electrical modalities; for the surgical procedures of the continuous current, the employment of the electrical current in the production of light and the X-ray, and the uses of high potential electricity, cover the widest range in the field of therapeutics to-day.

The electro-therapist, however, if he chooses to be designated by the title, is very narrow-minded if he will not embrace the application of mechanical vibration as an adjunct in the treatment of his patients. What we look for to-day, is not a controversy as to the relative merits of therapeutic agents, but a broader conception and selected discrimination for the application of the different measures and methods as shall best suit conditions as they arise. It is to be deprecated that there are any so narrow and commercial in their views as to set forth a narrow doctrine, which would exclude all but one of the valuable physical therapeutic measures.

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THE LATER CONCEPTIONS OF ELECTRICITY.

It has been the common expression of the scientific mind for centuries that we know the powers and properties of electricity, can harness it, and make use of it in commercial and

scientific pursuits, but no one can define it. The investigations of Thomson, Crookes, Lodge, and other able investigators seem to have solved the problem, and electricity instead of being a mode of motion as we have looked upon light, heat, and the other physical forces, seems to be the embodiment of all force and motion—a substantial thing of which light and heat are manifestations. It seems to be the basis or foundation element of all nature, “the atoms of which matter is made.” Should future investigations demonstrate the truth of what seems now almost an established fact, the elements which have stood against subdivision into their component parts, may, as it seems, be divided into atoms of electricity. Hydrogen, the chemical unit, has been divided into more than 800 of these atoms, and it seems to remain only for the future to resolve all elements into the same constituent. How great the conception! How omnipotent the force of electricity; and how near the solution of the great problems of the universe, if this is ultimately effected!

The effect of such a discovery upon chemistry, will be revolutionary, but in its mechanical and medical uses the conception will not influence to a great extent any change in its employment.

The mechanical influence of electricity is the action to which the medical mind is being constantly drawn, away from the mysterious action of this wonderful sort of energy, which now that it is recognized as a physical thing of substance, and not a form of energy due to the exercise of influence of other forms of energy, seems to be the fundamental source of all energy. Its action, then, upon the economy in currents not possessed of sufficient quantity, but under conditions of high tension are capable of acting as excito-motor influences, and capable of energizing various functions of the normal body by setting up the normal physical activity. Viewing its action from this point of observation, all that is required to produce with it these beneficial effects is an intelligent employment.

Unquestionably the time for the realization of electricity in medicine is at hand, and this knowledge of its true character will in no way detract from its employment, and will, it is believed, call forth a more earnest recognition.

Progress in Physical Therapeutics.

DIETOTHERAPY.

Dietary of the Child in Health and Disease. By Herman B. Sheffield, M. D., Post Graduate, August, 1904.

The diet for healthy infants until the ninth month should be only milk; then, as salivary digestion is now fully established, carbohydrates in the form of a crust of bread or zwiebach can be given. When the child is one year old, the child should learn to digest some food other than milk—in case an emergency arises—when an exclusive milk diet may be contraindicated,—as, for example, in gastro-intestinal disorders,—cereal gruel, soft-boiled egg, toasted bread, oatmeal, crackers, strained chicken, mutton or beef soup, orange juice, later baked apple, baked potato, with a little cream or sweet butter, will be found suitable additions to a plain milk diet. Of course, the transition from an exclusive milk diet to a more or less mixed diet, should be very slow and gradual, and should be watched from day to day, from week to week, always bearing in mind that milk is the ideal food of the young child. Indeed, milk should be the chief constituent of the child's diet until the sixth year, but after the end of the second year, gradually the milk diet should be displaced by the articles of food just mentioned, and some others, as, chicken broth, mutton broth, scraped beef, rare steak, mutton chop, white fish, fresh vegetables, rice pudding, custards, cocoa, etc. Forbidden are all kinds of pastry, confectionery, and fried food. Very often children at the age of a year or a year and a half discontinue drinking milk. The author believes this is due to the advice of the family physician that the bottle and nipple are the only companions of the child for many months past. Why the bottles and nipples are considered as a source of all evils to the child is a mystery to the author. In fact, the use of them should rather be encouraged than discarded, because through a nipple the milk enters the stomach very slowly, farinaceous water, albumin water, peptonized or malted milk, as well as water, can best be administered by means of a bottle and nipple. Of course, scrupulous cleanliness is self-understood. During sickness it is best to take nature's methods as a guide, that means to prevent over-feeding, while the digestive powers are gradually diminished. It is often surprising to see very delicate infants withstand a grave siege of sickness with hardly any nourishment at all—like fish, they seem to thrive on water—and this should be given to them at liberty. If force is used, the food should be given in liquid

form and in small quantities, as diluted milk, toast water, farinaceous water, albumin water, peptonized or malted milk, etc. In breast-fed babies, the breast milk can be given by means of a spoon or a dropper. Older children may be nourished on strained cereal gruel, kumyss, matzoon, lactosomatose, eggnogg, chicken, mutton or beef soup, beef tea, beef jelly, water ices, ice cream, fresh fruit juice, etc. In delirium or stupor the child may have to be fed by gavage or by rectum. Rectal feeding may become indispensable, but should only be employed as a last resort, as it is very apt to produce irritation of the rectum, and as the infants rarely retain the nutrient enema for any length of time. Such rectal feedings may be given for three or four hours, and consist of peptonized milk, milk and egg.

Treatment of Bilateral Diffuse Nephritis. By G. Kövesi and W. Roth-Schulz. *Berliner Klinische Wochenschrift*, Nos. 24 and 43.

"According to the authors, the rational treatment in this disease should aim to prevent, restrict, and abolish retention of salt, water, and nitrogen. To a great extent this can be accomplished by dietetic measures adapted to the varying insufficiency of the kidneys. A most important element is the retention of salt. Nephritic subjects with a tendency to dropsy should be carefully watched in regard to the intake of salt, and even without this tendency, attention should be directed to the retention of salt as a menace to the fluid balance of the body. In cases of perfectly compensated contracted kidney, retention of salt seldom occurs, and can be prevented by avoiding highly salted foods. As the normal proportion of salt in the urine is about 5 per cent., the patient can safely ingest as many as ten 1-2 grams of salt daily, as he excretes hundreds of c.c. of urine. For instance, when the daily urine amounts to 1000 c.c. he can ingest ten 1-2 grams of salt with impunity.

"In the same way, the intake of water should be regulated. A moderate amount of water when taken by a nephritic subject, with a tendency to dropsy, will not permit the elimination of the solid constituents of the urine. While the retention of water is favored, the retention of the solid constituents is not obviated and thus hydremis and hydrops are exaggerated. The criterion here, is likewise the diuresis. Excretion of 1000 c.c. of urine by a nephritic with a tendency to dropsy, corresponds to intake of 1500 c.c. of water. Reduction of the intake of water reduces the dropsy. When the water secreting power of the kidneys is unimpaired—that is, in well-compensated cases of contracted kidney—no toxins are circulating in the blood which can be expelled by increased diuresis, and the canaliculi are not obstructed by tube casts,

or clots which it is necessary to wash out by this means. Consequently the indications for increased diuresis are subordinate in these cases. The farther indications—to wash out more of the solid constituents of the urine—cannot be realized by increasing the diuresis, according to the writer's experience. Hence, they do not expect favorable effects from the copious intake of water in the cases of well-compensated, chronic, interstitial nephritis. It is even liable to prove directly injurious. Rational restriction of the intake of fluids is a better plan, the same as in certain cases of heart disease.

In the same way, the intake of nitrogen should be regulated. An exclusive milk diet supplies too much fluid for the proportion of calories. A strict vegetarian diet is scarcely practicable for any length of time. The components of the diet should be quantitatively regulated to meet the varying functional capacity of the kidneys.

"When retention is once established dietetic measures are unable to influence it, and thus diaphoresis will be the most powerful means for elimination of the solid constituents. Experiments in the clinic have demonstrated that sweating procedures are able to induce the elimination of solid substances in the sweat whose average was about 10 to 20 per cent. of kidney elimination, and in some cases as much as 50 per cent. After a vigorous sweat, the blood was found far less concentrated than it was before, notwithstanding the copious excretion of water. Diaphoresis is therefore the sovereign remedy for contracted kidney, with pronounced retention of water and hydrops, and the writers would restrict it only to these cases, but then use it freely, refraining from an increased intake of water, at the same time, as this would annul its effects."

In the severer cases all our measures will be powerless. Dietetic treatment will be impossible, and we will be reduced to merely symptomatic treatment. Therefore our aim should be to ward off this severe stage; and this can only be accomplished by preventing and combating retention.

HYDROTHERAPY.

EDITED BY CURRAN POPE, M. D.

Abdominal Palpation in the Warm Bath.

Stricker (Centralblatt für Inn. Medizin, March 5, 1904) originally advocated this method thirteen years ago. It permits palpation of abdominal parts and organs much more deeply than the ordinary methods practiced, and it can often replace on this account, examination under an anæsthetic. The author has diagnosed, by means of the warm bath, displacements and adhesions of the abdominal organs, atrophy

and enlargement of the liver, the spleen and the kidneys, calculi in the gall bladder and renal pelvis, exudates, and tumors which could be felt vaguely or not at all by ordinary methods of palpation.

Hot Baths in Cerebro-spinal Meningitis.

Since its introduction by Aufrecht in 1894 the method of treating epidemic meningitis with hot baths has been often and favorably reported upon. W. M. Rojansky employed the method in a series of cases, and is well satisfied with his results. The earlier the treatment is begun the better the effect, and the lower the mortality. Out of ten patients treated from the first four days only one died—certainly a low percentage. Out of 41 patients treated with hot baths after the fourth day, 16 died, making a percentage of 39. The immediate effect of the hot bath is very striking, the unconscious patient rapidly regaining his senses. Sometimes this is accomplished after the second or third bath. Delirium and excitement are allayed, or disappear entirely. The excruciating headaches yield noticeably to the hot bath, while the same is true in a less marked degree of the spinal pains. Insomnia is also favorably influenced. Other symptoms, like fever, vomiting, muscular rigidity, have not been affected by hot baths in any notable manner.—*Amer. Med.*, July 2, 1904.

The Rational vs. the "Regular" Treatment for Typhoid Fever; Hanna's Case, and Some Others.—Charles E. Page, *Amer. Med.*, July 16, 1904.

C. E. Page advocates the Brand treatment, and gives no food of any sort, except water, until the patient is safely convalescent and actually hungry. He has never even in the worst cases, found occasion for more than five or six full cold baths, and if the case is seen early, a more moderate hydrotherapy is sufficient. No end of fever patients have emaciated to skeletons during forced feeding, being both starved and poisoned. After convalescence is established, and the patient hungry enough to pronounce stale Graham bread delicious, this will be a good risk. Two or three times daily after a day or two he may have a moderate portion of such bread, and a few stewed prunes, but the bread must be chewed by itself and not moistened with any fluid but saliva.

Physiological and Clinical Aspects of Hydrotherapy, with Special Reference to the Treatment of Psychoses.

R. D. Baker (*Medical News*, March 26, 1904) claims that primarily the action of water is that of an irritant to the peripheral sensory nerve endings, and in this reflex way affects the circulation, respiration, temperature, tissue change, and secretion. The writer gives a description of his work

among the nervous insane. He found the wet pack, 65° F., or the full bath at 65° to 105° F., very useful in excited cases and in insomnia. He classifies his cases as follows: Acute melancholia, acute melancholia with agitation (dementia præcox), hysteria, and puerperal insanity. The patients, by this treatment, become brighter and more interested in things about them. The physical condition greatly improves, the appetite increases, and with it the body weight. There is improvement in general muscular and nervous tone. Hygienic and medicinal measures are continued at the same time. The hydriatic measure used, depends upon the condition of the case under consideration. The author has also found hydriatic treatment of great value in measles, scarlet fever, and pneumonia.—Modern Medicine, May, 1904.

Appendicitis.

Robert T. Morris, when asked as to the method of preventing the disease says: "The removal of constipation is the removal of one of the dangers." There is constipation necessarily. It is due largely to interference with peristalsis. The history of the disease is a history of constipation. Then, when a person who is naturally more or less constipated, has the early, prodromic symptoms of appendicitis, let the constipation be corrected, and correction means restoration of natural peristalsis.

Let there be moderation in eating. Nourish him on easily digested diet. Get the bowels regular and keep them so. The free use of pure water is an effective laxative, obviating all drastic methods. Beware of purging. The small intestines do not need it. The colon is impacted, and its contents should be quickly washed down with a hot, saline, soap enema. With a little patience the water can cleanse the canal up to the cæcum; and the colon freed of its contents is an important beginning of treatment. Having cleansed the colon, follow by an enema of sweet oil, that the mucous membrane may be healed. Repeat the water if necessary.

Apply cold compresses to the affected abdominal area, to allay heat and pain. The clothing next to the skin should be light and porous. The relief of pain must be circumspect, or it will impair every chance of recovery, and set at naught every important feature of treatment. Do not give opium or morphine. When the disease has progressed so far as to demand operation, accede to the demand at once.—Modern Med., May, 1904.

Sea Voyages.

As a tonic, a restorative, and a sedative for brain-fagged people, a sea voyage may do wonders. For consumptives in

whom the lesion is slight or latent, a voyage to South Africa is often excellent, but not for those in whom the disease is active. Cases of nervous disease, angina pectoris, exophthalmic goiter, or chronic bronchitis should never be sent to sea. For seasickness the patient should be brought under treatment several days before sailing. The action of the bowels should be attended to, any dyspeptic conditions remedied, and sedatives administered, such as ammonium bromide.—*Brit. Med. Jour.*, March 19, 1904.

PSYCHO-THERAPY.

EDITED BY LESLIE MEACHAM, M. D.

Six years ago, Professor J. J. Putnam, the distinguished professor of nervous and mental diseases at Harvard, delivered the Shattuck annual address to the Massachusetts Medical Society, upon the subject of suggestive treatment. This year at the annual meeting of the same society, papers were read upon practically the same subject by both Professor Putnam and Dr. Robert T. Edes. The latter discussed the question from the standpoint of the general practitioner, and the former from that of the specialist.

Dr. Edes suggests that there is a sort of a polarization of physicians into two groups, the one recognizing all the various forms of mental influence, and the other tending toward an extraordinary polypharmacy. He interprets the success of physicians through all the changes in *materia medica* as largely due to the moral support, or encouragement, the relief from responsibility, the substitution of decision for doubt, even the preservation of a masterly inactivity when necessary. Of course, we do not expect or admit any influence of outside or foreign mind or spirit or nerve function upon the bodily processes of any patient except through the patient's own mind or emotions. After discussing various pathological conditions, he concludes, "We are justified in saying that over-infections, degenerations, slow organic processes not dependent in any way upon mental activity, such as are those which very largely control the duration of life, the general health and the vigor of the constitution, direct psychic influences are practically nil. Psychic influences come in contact with organic processes to affect them through the nervous system, and in particular through the vaso-motor and secretory nerves, and systematically not only these, but also the ordinary motor and sensitive." The secretions are, as is a matter of common observation, largely under the mental influences and impressions. The effect of mental influence upon the movement of the bowels is notorious and utilized not only by physicians, but the faith curists. This is true also of the secretions of the

kidneys. Mental influences are recognized in many functional cardiac phenomena, including palpitation. Men awaiting a competitive physical examination have been found with systolic murmurs which disappeared when success was assured. Students awaiting examination may have albumin in the urine.

There are left for examination those sets of symptoms, which are closely connected with mental and emotional activity through the consciously or subconsciously active, sensitive and motor system, *i. e.*, the so-called functional disorders. Still some seemingly functional disorders, as insanity and melancholia, do not respond well to treatment. In these cases we are unable by argument or exhortation to present matters to the patient in any such aspect as to bring about the desired change in mental condition. Still psychic treatment remains of value as an adjuvant and in the relief of symptoms. Cases left include those of a psychic nature which counterfeit something of a more serious and organic nature; that is those in which there are inhibitory influences of purely mental or psychical origin which can interrupt or disarrange the normal associations of movement and association. Neurasthenia proper is in its essentials not especially amenable to psychic influences, but their value as adjuvants can scarcely be overestimated. If there is a real deficiency of nervous force, time is required to bring back what has been over-expended, but other conditions being favorable, the psychic influence is necessary to enable the elements to profit by the nutriment brought to the cell. Hysteria is undoubtedly the favorite stamping ground of the faith curist and the miracle monger, not under its own name, but under those of the organic diseases which it counterfeits. Two diagnoses are necessary,—that of the disorder and that of the patient. When the physician is sure that he is dealing with a case of neuromimesis he cannot be too strong in his encouragement and exhortation, and he may then assume more of authority than comes from a simple scientific knowledge of the subject, give no reasons and not name the disease. This is not an universal rule. The ways in which treatment to the patient's mind may be given vary as much as there are different physicians and patients, but the essential thing is the implanting not merely in the patient's conscious and reasoning mind, but in what we call, as it seems to me somewhat inconsistently, the "subliminal consciousness," that is the store room of past and forgotten associations, ideas, and emotions of which the patient is not at the time definitely aware, but which may be in various methods reached, the idea of recovery and health, of the unreality of pains, of the ability to walk or talk. A strenuous repetition of a positive assertion seems an absurd method to be advanced when unsupported by any argument, proof, or illustration, but if anyone doubts its efficacy, why do medicine

makers find it to their advantage to disfigure miles of railroad and square miles of territory with simple repetitions of the statement that children cry for "Catcher's Gambogia"? Many of the various modern mechanical means of treatment, especially those which are used in chronic nervous diseases, owe a certain part of their efficacy to the constant impression of something being done. Electricity, for instance, is difficult to disentangle from this element of error. Psychic therapeutics finds but little scope among acute and chronic infections, degenerations, scleroses, and new growths, but as an adjuvant to the healing forces of nature and time, it is, and always will be, a most precious resource of the physician, and he who wields it most judiciously will be the most successful. Among the psychoses the process is reversed, and the physician must look upon the building-up processes, and the various appliances in use, pharmaceutical and otherwise, not only for their real and direct but for their mental impression.

For either case he must look before all for a diagnosis.

Professor Putnam's paper, goes more into the details of psychoses, but recognizes practically the same field for the application of mental treatment. As to the occurrence of hysteria in connection with neurasthenia, it may be said that it sometimes happens that persons who have suffered from neurasthenia fall into habits of invalidism which cling to them long after they have really recovered from their original illness, and which the memory of their former illness makes them reluctant to disregard. These cases are easier to deal with than another class represented by the morbid fears, fright psychoses, insistent ideas and epileptiform or hysterical out-breaks, and yet with these some of the best work in the last ten or twenty years has been done. Some of these ideas prove to be possessed of little substance if resisted boldly, and a determined adoption of an attitude of dogged resistance, based on confident and authoritative advice, will often suffice to carry the patient through the first severe trials. Sometimes the triviality may be made more evident through a demonstration than through a distraction. The so-called psychology of the sub-conscious life is based on data which are contributions of medical science. These studies have taught us that while we regard ourselves as free agents and our mental life as forming one harmonious mechanism, no one is really so free, no one's life is so complete a unity, as he would like to think. Every one of a man's acts expresses, in a sense, a history of his life. What he has done before he will tend to do again. The old habits and motives (themselves the expression of this total and partly unconscious experiences) will ever strive to assert themselves. We instinctively push to the front, into the fields of our habitual consciousness, only those memories and motives which seem of distinct utility in the attainment of

our present conscious needs. This arbitrary group of memories we call "ourselves," and we push out of sight those experiences of our past life which do not harmonize therewith. But it often happens that these painful experiences refuse to be banished thus cavalierly, and the refusal to deal with them does not make them disappear from the mind, and as they are not assimilated they live a sort of a parasitic existence in the mind, and form a species of organization hostile to the well-being of the individual, and a serious breach is made in the unity of the conscious life. This is often called "dissociation of consciousness." Thereafter when a call for action comes a double set of reflexes will tend to show themselves, one set expressive of the organized experiences which are desired as a part of the identity, and the other those undesirable. Thence the conscious mental life will be marked with confusion. The function of the doctor is to heal this breach, to neutralize the dissociation which has taken place, and to restore the previous unity of the mind. It has often been found that painful experiences work mischief because they are hidden from the patient's view. The aim then is to bring back to consciousness the hidden experience so that its real significance can be understood, when cure takes place. It may require skillful questioning, great patience or even formal hypnosis to disclose the whole story. When hypnosis is employed the patient is assured that when he awakens from the trance he will remember all the facts connected with the painful experience which is to be discovered and to be removed. Hypnotism has been condemned as dangerous, but as a matter of fact the dangers urged do not exist. There certainly can be no objection to it when it is employed by a skilled person for such purposes, and to make a person master of himself, and it may be used as a means of strengthening and not weakening the will. It is idle criticism to object to hypnotism as a morbid state analogous to hysteria. Morbid states are continually induced for therapeutic purposes, as by ether and morphine. In each case, the only question is as to the value and significance of the final result regarded in all its aspects. It should be distinctly remembered that the necessity for mental treatment, even in the severer cases, does not exclude the need of general and local treatment, and this is true even in those where, by strongly turning the mind in one direction or another and enriching the conscious interests, we can enable the patient to overlook and forget his sufferings.

The neurologist of the future will seek to treat his patients upon the basis of a broader and more intelligent study of their individual experiences and of the influences to which they have been exposed.

He will try to leave each one better able to understand him-

self, less inclined to waste his strength in aimless self-reproaching, or to yield to paralyzing fears, and more inclined to engage earnestly and hopefully in the task of successfully asserting his intelligence, his conscience, and his will. No attempt need be made to draw a sharply dividing line between physical and mental therapeutic agents. It is desirable on clinical grounds to recognize that a kinship exists, between the influence that improves the nutrition of the brain by increasing the harmony and efficiency of its functions, and that which reaches the same end by improving the quality of the nutrient fluids, or the mode of distribution. With this principle borne in mind, the physician will be more apt to treat his patient from various points of view simultaneously, and not to neglect the one for the other.

SOCIETY MEETINGS.

FOURTEENTH ANNUAL MEETING OF THE AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION,
HELD AT ST. LOUIS, MO., SEPTEMBER 13TH
AND 14TH INCLUSIVE, 1904.

TUESDAY MORNING, SEPTEMBER 13, 1904.

Meeting called to order by the President at 9 o'clock.

Address of Welcome.

Dr. C. H. Hughes, St. Louis, Mo., said: Mr. President, and gentlemen of the American Electro-Therapeutic Association, in behalf of the profession of St. Louis, I welcome you to our city.

The profession of medicine is especially interested in this Association. It is an association, practically, of the 20th century. It had its inception, it is true, in the waning years of the century which has passed, but its greatest achievements have been in the present century.

We welcome you as the coming aids in the science and the therapy of the human organism.

We welcome you, gentlemen, as having followed in the footsteps of the illustrious Franklin: you have chained the lightning, and made it do your bidding. The American Electro-Therapeutic Association has taken a permanent place in the very forefront among associations devoted to the interests of science. Our work places us with the illustrious Morse, and his colleagues, and with other men of the greatest eminence in the field of science.

You have transformed the lightning into an instrument of healing, an instrument of benefit instead of danger to mankind, and while others have made it do the bidding of man, and answer to his coarser wants, your efforts have been to-

ward the higher needs of mankind, in preserving the human organism, and in assisting in the destruction of micro-organisms, those constant enemies of human health and life.

You have enjoined the powers of heaven, not as has been sometimes said, by psychic impression, but by the use of real material, medical impressions, taken from the elements, and made to do the bidding of man, and having done this, you are entitled to a high place among the sciences, a permanent place among the workers of the world, and an elevated place among the benefactors of mankind.

The potentialities of the resources at your command are yet in the infancy of their discovery. You are a young Association, 14 years of age, and that is not a great length of time in the life of an organization, and yet, in this time, Mr. President, how much has electro-therapeutics accomplished!

The scoffers no longer sit in the back seats of the synagogue, and the seat of the scornful is vacant in our midst, yet I can remember the time when my remarks upon the use of electricity were not seriously considered, I can remember when it was difficult to get an audience in the regular medical society that would listen with patience to such a practice.

Since that time cataphoresis has come into use as one of the potent and certain resources of medication.

I welcome you because of the great work you have done so far; I welcome you for the personalities, and for the personal esteem in which I hold those of you that I am personally acquainted with, and those of you whom I know better by reputation; I welcome you also for the potentialities in that branch of the profession which you represent; I welcome you for the glory which you have brought to our great profession, which has received luster from your achievements in the past, and which awaits further luster from the work which you are yet to do.

Gentlemen, I welcome you in the name of the authorities of this Fair, who extend to you a most cordial invitation to assemble to-night in one of the buildings of the State, and the authorities will be there to receive you.

And I welcome you in the name of the citizens of this community, the latch-strings to whose doors are ever out.

I welcome you in behalf of all interests.

Dr. C. R. Dickson, Toronto, Ont., Can., in replying said: It is my privilege and pleasure to respond to this very hearty speech of welcome. I think, perhaps, when such a well-known neurologist speaks favorably of electro-therapy, we are indeed to be congratulated.

And we are pleased to know that we are welcomed by the authorities of this immense Fair, which I doubt if any of us could see fully in the few days at our disposal, or even in a few

months, had we that much time, and I doubt, even, whether we could see it thoroughly in a lifetime, and thoroughly appreciate it to its fullest extent.

It is pleasing to know that electricity is at last getting its reward.

Our Association is a young infant, but a vigorous infant.

The Doctor has alluded to our having stolen the lightning. From the amount of noise which we are making, it might seem that we have also stolen a fair amount of the thunder.

Electro-therapeutics is becoming better appreciated by the profession.

I think that a man who goes out now to enter the practice of medicine without a fair knowledge of electro-therapy has missed one of the most important subjects of medicine, has made one of the greatest mistakes of his life. No man is fully equipped to enter the profession, and take up the battle against disease until he has a knowledge of this subject.

We cannot be too well prepared. Disease is a hydra-headed monster, and we must never allow it to conquer us. More forms of disease are yielding to electro-therapy than to any other one treatment.

It is a happy omen for this science that at this time is being held an International Congress of Electricians.

When this great Fair was projected, some of the authorities wondered whether electricity should be given a separate building. They said it was part of machinery, and Machinery Hall should include everything.

Then this International Congress came into existence, and did not confine its work simply to the mechanical work of electricity. They said, "We must recognize that electro-therapy is part of electricity," and a very important position is given to the subject in the programme of the International Electrical Congress, but this is the first time our science has been recognized, and I think that means a great deal for us.

By being recognized by electrical engineers, we will have wider recognition from the general public, as well as surgeons, and I therefore think it would be a good idea, and would pay a compliment to the Electrical Congress, if this Association could see its way clear to adjourn and proceed in a body to the Congress, and then take up our work in the afternoon.

Dr. C. H. Hughes, St. Louis, Mo.: I have the honor of introducing to you the President of the Missouri State Medical Association, Dr. Moore.

Dr. W. G. Moore, St. Louis, Mo.: Mr. President, and gentlemen of the American Electro-Therapeutic Association, through the unaccustomed bungling of Dr. Hughes—I say unaccustomed—I feel that you gentlemen have been done an injury from the fact that he has accorded one of the local profession one of the very pleasantest duties that can be

assigned at this meeting,—that of welcoming the stranger within our gates.

We have welcomed the whole world within our gates this season. They have always been welcome, for that matter, but especially so at this time, and it extends from the highest courts and diplomatic circles of Europe to the wilderness of the Philippines, from whence we have the Iggorote.

We have welcomed these various people for various purposes; these diplomats for diplomatic purposes; these commercial men for commercial purposes; these Iggorotes for anthropological purposes, but these doctors for humanitarian purposes, and there are no men gathered here from any place or for any purpose that are more sincerely welcome than these doctors. Now, why is this? Because you have brought from the storehouses of your minds, and your life's work, not some commercial commodity to be sold or bartered, but like the waters of life, they are to be given freely, and whosoever will may come and drink without money and without price—I mean, gentlemen, of your knowledge: the other drinks cost something.

But, there is a significance to this meeting that the heedless throng will never dream of. Long after these heedless ones have passed away, however, the work of this Society will go on, bringing benefits to the worthy, and to the unworthy.

It would be presumptuous for me to take your time for anything more than a short expression of my feeling, but there is one thing that I wish to inject into this meeting, and that is an appeal to you medical men to take up with renewed energy, if you have taken it up at all, the question of medical men in politics, and make this world feel that there is not a body of men on earth more powerful politically, or otherwise, than the medical profession. I feel that this subject must meet a response. We are just waking up to our political and social power, and, gentlemen, I think it is time to stop the lies and calumnies against our profession. I have spoken earnestly on this subject, because it lies so close to my heart.

I must state that I was surprised at seeing such a young-looking man occupying the chair, and the reason is that one of the first medical books I ever owned was a little blue volume, and the name of the author was Dr. Alphonso David Rockwell. When I saw him, I asked Dr. Hughes if it was possible that that was Dr. Rockwell, and he said it certainly was. I know I express the sentiments of all of you when I wish him many happy returns, and may he live long and prosper.

Now, about the Pike, here at the World's Fair, I remember a little piece of doggerel from Colorado, running after this fashion, though the words are not exact:

We had an Uncle Ike, and he wrote us a letter
To go piking up the Peak,
But there lived in old St. Louis a better uncle still,
And we asked his name of mother, and she said it was Uncle Ike,
So he wrote us a letter, telling us how they have their fun,
And 'twas peeking up the Pike."

So, if you will peek up the Pike, you will perhaps feel better the next morning after. It is a place in every way superior to the Midways of the past.

You have heard of St. Louis politics, of the St. Louis boodlers. I want to assure you that you are perfectly safe from them. They are in a cage looking out upon the world where honest men labor. Feel perfectly free and fearless about going anywhere about the confines of this city, and of the imperial State of Missouri.

We welcome you most heartily. The medical profession of this State and city would not only turn this Inside Inn outside, but would turn the Outside Inn inside for your accommodation and entertainment.

Dr. C. H. Hughes, St. Louis, Mo.: It affords me pleasure to introduce to you Dr. B. M. Hypes, President of the St. Louis Medical Society, who will now address you.

Dr. B. M. Hypes, St. Louis, Mo.: Mr President and fellows of the American Electro-Therapeutic Association, I knew as soon as I entered this room, and saw Dr. Moore in the place where I now stand, that it would be superfluous for me to attempt to say anything that would make you feel any more welcome than you do after having listened to his speech, but Dr. Hughes has invited me to come here as the President of the St. Louis Medical Society, and in behalf of that Association I do bid you a most hearty welcome to our city.

I see from your programme that you have a great deal of work before you, and have very sensibly divided your work into half-day sessions. That means, I take it, that you intend combining business with pleasure: business first, and pleasure afterward.

I had intended taking time to say something about the interests of this Society, but the hour is late, and I will pass that over.

I want to mention, however, a few things about our locality, and our city, which I commend to your attention. I promise you that I will be very brief in this.

This great Exposition is, of course, the center of interest. It is so broad and so great that one cannot hope to take it all in in an ordinary visit or investigation, but parts of it can be taken in by all of us with the greatest advantage. It is, in reality, a great university, and I do not know of a place anywhere that a week or two weeks could be so profitably spent as roaming about this great Exposition.

Do not forget what Dr. Moore has said to you about the Pike. You can go there without any fear of your moral senses being shocked.

We have a great many places of interest in the city, which would be especially enjoyed by the historian, or he who is interested in the progress of our great city. I would like for you gentlemen to take half a day, or two half-days in riding around this city and visiting some of its places of interest.

Drive down and visit our Academy of Arts and Sciences in connection with Washington University. Drive on down to the foot of Walnut Street, where LaCledé first opened his trading post. One block west is the location of the building where the Spanish Commissioners, the French, and later the American Commissioners located their offices. Within a half block of that is the old, old Cathedral, the first substantial church building that was built west of the Mississippi River. In that building, about the year 1830, Bishop Roscetti blessed Father Sancier as he went off to labor in the little village that is now known as the City of Chicago. Evidently, his blessing had effect, as is evidenced by the growth of that city. Four blocks up is the location where the old Spanish fort, Fort St. Charles, was located, and it is the place where the American troops were located for the protection of this great frontier. Right at the end of this old fort was located the burial place of the Indian chief, Pontiac, who was a friend of the white man. Ride a little further, and you come to some of the modern improvements. If you had more time, it would well pay you to go on and visit the Cupples Block, where business is carried on on a scientific basis, where the cars are not only run right into the business house, but are elevated to the various floors of the building, where they are unloaded, or loaded with goods for the various parts of the world. It is known as one of the most successful business enterprises in our country. Go a little further west, and you will find our City Hall, and the Courts of Justice, where were convicted those boodlers whom Dr. Moore mentioned, and with whom he is so intimately acquainted. Then go a little further down and visit again the place which you probably first saw, when you entered the city, the Union Station, the largest and grandest in the world. Then, if you have any desires like our Teutonic friends, if you like the odor of rye and malt, go down and visit the brewing establishment of the Anheuser-Busch Brewing Association, covering 125 acres, and turning out the largest and best output of any establishment in the world. Try it and see: it is free to you. Then visit that wonderful place, Shaw's Garden, said to be one of the best and most scientifically managed botanical gardens in the whole country, if not in the whole world. Then drive through this vast park, and around the Exposition grounds. This is known as the second

largest park in the United States. Then drive through our residence district, and see if you can find anything to admire. Without wishing to take up too much of your time, I will state that I have received a letter from a gentleman who resides in Boston, and who is lavish in his praise of the beauties of our residence district. He states that he had the impression, although he did not know why, that our residences consisted of a lot of tumbled down buildings, and that he was most agreeably surprised to find a residence district more beautiful than any he had seen. He spoke especially of the fact that our residences are separated from each other, having beautiful lawns and shade trees in abundance. In the Eastern cities, there might be some mansions more palatial, individually, but the effect of the whole was nothing to be compared with the residence districts of this city.

We hope that you gentlemen will visit us in our homes, and we hope that this meeting will be a success, scientifically, socially, and in every other way.

Dr. Daniel Roberts Brower, Chicago, Ill.: Mr. President, and fellows of the American Electro-Therapeutic Association: I esteem it an especial privilege to be permitted to respond to these very inspiring addresses to which we have just listened.

Coming, as I do, from the big city at the other end of the drainage canal, it affords me pleasure to testify to the grandeur of this Exposition, and its marvelous superiority over the one given in the City of Chicago a few years ago. This great City of St. Louis has been a wonderfully apt pupil, taking the lessons that we furnished her and profiting by them immensely.

To the members of this Association, the place is full of inspiration. I spent the afternoon yesterday in the Electricity Building, and I hope each of you will do the same, and I would strongly advise that you spend more time there, if possible. Here you get a practical demonstration of the wonderful progress that has been made with this agent in its commercial aspects, and I am sure we can all draw inspiration from it.

You will here become familiar with the present state of progress of electro-therapeutics.

Without taking up more of your time, I desire, on behalf of the Association, to thank the gentlemen for the most cordial reception they have given us.

Dr. Charles Rea Dickson, Toronto, Ont., Canada: I move you, Mr. Chairman, that this Association adjourn to meet again at an hour to be named by the President, and that we proceed in a body to the meeting of the International Electrical Congress.

Dr. Clarence Edward Skinner, New Haven, Conn.: I would like to amend the Doctor's motion, as follows: That the re-

ports of the Standing Committees be regarded as having been read.

Dr. Dickson: I accept the amendment.

Dr. George Betton Massey, Philadelphia, Pa.: I second the motion.

The motion was carried, and the meeting adjourned until the next regular session.

NEW AND IMPROVED APPARATUS.

This department is devoted to publishing, with illustrations, drawings, and descriptions, new apparatus, electrodes, etc., for the benefit of those interested in the progressive improvements in armamentaria.

A NEW HIGH-FREQUENCY COIL.

At a recent meeting of the Massachusetts Medical Society a very unique coil was exhibited, which attracted a great deal of attention.

The coil itself is mounted on a highly finished cabinet, with all the working parts out of sight, and with simply the switches and terminals on the outside. The interrupter is novel, absolutely noiseless, and positive in operation, requiring no adjustment or attention even in a run of many hours. The frequency of the coil is extremely high, and the quantity of current very large.

In applying the current a crown breeze of large volume, very similar to that from a very large static machine, may be given to the patient, or the various metal or glass electrodes may be used. There is not the slightest danger of accidentally sparking the patient. By means of sponge electrodes, a sort of faradic effect may be obtained. Also, a sensation of heat, or the combination of the two. An incandescent lamp may be lighted to full brilliancy when put in contact with the patient.

For X-ray work the machine is very satisfactory and extremely easy on tubes, much resembling a static machine. By a very simple contrivance, the bones may be shown dark or light at will without any change in tube or vacuum.

A bulletin describing this apparatus is now in preparation, and Swett & Lewis Co., 18 Boylston Street, Boston, Mass., will be glad to send it to anyone interested, on request.

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SOME OBSERVATIONS ON THE MEDICAL USES OF THE CONTINUOUS GALVANIC CURRENT.*

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A study of the current medical literature and of the proceedings of this and kindred societies leads me to the conclusion that the profession is drifting away from the medical uses of the continuous current. This is probably due to the great improvements that have been made in static machines during the last few years, in the discovery of the X-ray, and in the introduction of the high frequency, high-potential current. These several agents are so much more convenient to use, and have such a striking effect that we are losing sight of the advantages of the direct and constant current that does its work so quietly. Some of this may be due also to the disappointment that has come to the members of the craft by their using as the source of the continuous current a dynamo rather than chemical action. The current from the dynamo is pulsating; that from the chemical action is steady. And this difference is very important when a very sensitive patient is under treatment. And then, again, the ordinary rheostats used in the physician's office do not reduce amperage and voltage *pari passu*, and this also gives annoyance to sensitive patients. For cerebral applications especially, it is important that the current should be steady, that it should be of low amperage and of low voltage; but, on the contrary, if the case be one of inflammatory exudates in joints or tendons, for example, there is some clinical advantage in using the pulsating form of the direct continuous current, for a much quicker result can in this way sometimes be attained.

Valuable research work has been done recently by Stewart

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of England, and by Cleaves of our own society, on the chemico-physical action of this current, and Dr. Cleaves thus sums up, in an admirable series of articles that she is publishing in the JOURNAL OF ADVANCED THERAPEUTICS, her results:

"The first effect is the chemical effect of the products liberated by the electrodes or in the substance of the tissues.

"The second effect is due to the removal of the electrolytes, chiefly inorganic substances, which are necessary for the vitality of the tissues, leading to increased absorption of the elements, and perhaps in consequence to increased activity of the general nutrition in the tissues, degeneration, or death.

"The third effect is that which results from cataphoresis, leading to increase of transferred substances around the cathode and to their diminution around the anode and consequent increase of elimination or absorbing activity by which the tissue returns to healthy equilibrium or to any of the results which follow the disturbance of equilibrium beyond limits of health.

"And, lastly, is the effect that results from raising local temperature."

The physiological and general therapeutic effects of the current have been summarized by another of our *confrères*, Dr. W. J. Herdman* of Ann Arbor, Mich., and I take the liberty of presenting this *in extenso* in the doctor's own words:

"It causes contraction of muscular tissue, both of the striped and unstriped varieties, and invigorates the processes which depend upon this muscular activity—the circulation of the blood and lymph, intestinal peristalsis, muscular contraction of the bladder, uterus, etc. It is thus tonic, stimulant, purgative, and eliminant.

"By its action nutritive material may be conveyed in greater abundance to the tissues needing it, and the metabolism of the tissues may be quickened. Thus it is alterative, constructive, and restorative.

"Through its influence on the muscular walls of the intestines, the uterus, and excreting organs and blood vessels elimination is promoted, and the irregular distribution of blood as in hypostasis and passive congestion is overcome. Thus it is purgative, diuretic, oxytonic, eliminant.

"By means of it exudates and neoplasms are broken up by

* JOURNAL OF ADVANCED THERAPEUTICS, Vol. 22, No. 3, page 136.

electrolysis and prepared for removal. Thus it is both destructive and eliminant to injurious and useless products.

"By its aid morbid fluids and substances in solution in them are removed from the tissues of the body, and remedies in solution may be brought into them. Elimination and medication by phoresis.

"It is both directly and indirectly germicidal because of its electrolytic action, and gives promise, in the results of recent experiments, of a capacity to transform toxins into antitoxins. Thus it is antitoxic, antiseptic, disinfectant.

"The local effects of the anode of a constant current upon nerve tissues is such as to diminish its excitability, giving an action sedative, analgesic, antispasmodic."

These conclusions of our two *confrères* as to chemico-physical, physiological, and therapeutic properties cannot be gainsaid by any careful and conscientious student of the topic. And it is surprising that there should be so many in the profession who are unwilling to admit anything in the medical uses of this powerful agent except such as is the result of suggestion. They tell us that it is all psychic; that this power, which has become such a factor in the economics of the day (and this has been well styled the electric age), so that everywhere around us its usefulness has made it a necessity, so that commerce and manufactories are so absolutely dependent upon it, that their forces would stop if the world were deprived of its use,—that such a power, some would have us believe, has no more effect upon the human body of a curative character than such as is purely mental, or than such as might come from the use of Christian Science or Dowieism.

The first observation upon the medical uses of this agent will be in connection with diagnosis. The value of the continued current here is not questioned even by the most skeptical of physicians. Take exophthalmic goiter, a disease that is easily diagnosed when its three cardinal symptoms are present, even by the merest tyro in medicine. But when there is no exophthalmos, and a very slight thyroid enlargement, and with but little tachycardia, the diagnosis is difficult, and in some of these cases we are enabled to make an earlier diagnosis and to clear up the doubts and uncertainties of the cases by the use of this current; for in a large proportion of them the electrical resistance of the body is so markedly diminished that there is no difficulty in determining it.

In tetany the diagnosis is usually readily made, but in certain cases its differentiation from hysteria is by no means easy. The galvanic current here assists us materially, because in this disease there is almost invariably a great increase of excitability. In a doubtful case of this sort I was enabled to clear up the matter by testing the median nerve and obtaining response with less than half the current of Stintzine's tables, and by being able to produce without difficulty anodal duration tetanus.

The changes in electrical reactions of nerves and muscles enable us to differentiate the atrophies of disuse and the myopathic muscular atrophies from organic nerve disease. The qualitative changes giving us the reaction of degeneration are easily determined, and when they are found we know that the muscle has been separated by some process from its trophic center, and then we know that the lesion is in the lower motor neuron. It is true that this conclusion may often be reached by other methods of investigation, but in certain doubtful cases its presence or its absence will be of great value to the diagnostician.

A laborer fell from a scaffold, striking on his head, producing a lacerated wound of the scalp. He was taken to the hospital unconscious. When he regained consciousness he was found to be paralyzed in the right arm. There was a difference of opinion as to the seat of the lesion, and this difference of opinion was settled most conclusively by finding in a few days after the accident the reaction of degeneration in several muscles, establishing the case as a peripheral injury, and not a cerebral one. This reaction of degeneration also enables us often to differentiate in medico-legal cases the monoplegias of the hysterical or psychic types, resulting from trauma, and so closely resembling organic disease.

As to the therapeutic uses of the agent, I would first call your attention for a moment to its use in cerebral diseases, and preface what I may have to say by quoting from an interesting lecture on cerebral galvanization, by Professor C. Le Duc,* of the School of Medicine of Nantes:

1. The brain is quite accessible by the battery current.
2. Applications to the brain are free from danger and, if carefully applied, are free from discomfort.
3. Negative applications appear to excite the functions of the

* Arch. d'électricité Médicale, May, 1899.

brain, while positive seem to have a calming and depressing action.

4. There is reason to hope for good effects in many diseases of the brain.

5. Negative applications afford a means, probably the best means, of relieving the effects of mental overwork and of raising the intellectual powers to their highest level.

Notwithstanding these deductions of Professor Le Duc and those of other distinguished students of this important topic, we have in the profession numerous distinguished physicians who are not willing to admit that a continuous current can be made to traverse the brain at all, forgetting that electricity in its activities always follows the route of least resistance, and when the electrodes are applied, one to the nucha and one to the forehead, the route of least resistance is through the brain, because the blood vessels are the best conductors, and everyone knows the close and intimate anatomical relations between the vessels of the scalp, the diploe, the meninges, and the brain. And why this current should go round the head and not through it under these circumstances is more than I can understand; and then we have those striking symptoms of which patients complain if we are not sufficiently careful in its application that could only be the result of irritation of the cerebral tissue.

Cerebral syphilis is greatly benefited by the use of a mild galvanic current, not exceeding two milliamperes, the positive electrode, three inches by six, applied to the forehead, and another (negative) of about the same size, to the nucha, the current to continue for about ten minutes and to be applied daily. This treatment, with the hypodermic use of the bichloride of mercury into the gluteal muscles, and as large doses of the iodide of potassium by the mouth as the patient will tolerate, will yield very much more rapid results than the treatment by medicine alone. My clinical experience in this direction is sufficient to enable me to make this assertion with the greatest amount of confidence.

Cerebral neurasthenia is another perplexing problem in therapeutics that will yield more promptly if we use cerebral galvanization by the method that has just been described, along with careful attention to elimination, the use of readily assimilable preparations of phosphorus, and a judicious combination

of rest and activity. I am very sure that my clinical observations in the use of cerebral galvanization enable me to indorse the general conclusions reached by the late Dr. Julius Althaus * on the value of mild continuous currents for the relief of the failure of brain power; and I desire also to emphasize the observations of Professor Le Duc, that the positive electrode has a calming or depressing action when applied to the forehead, and the negative has the contrary effect.

Cerebral paralysis, especially that due to hemorrhage, is also benefited by the judicious use of the continuous current; not that electricity or any other agent can restore parts that have been destroyed, but the paralysis that follows a hemorrhage is always much more extensive than the actual destruction of nerve fibers, for round about the hemorrhage focus the tissues are in a state of collateral oedema, and many fibers cannot functionate because of this pathological condition, and anything that relieves it promptly will restore power. For this purpose we use internally the administration of alteratives, and electricity is an alterative. A continuous current, not exceeding two milliamperes of strength, with a large electrode, should be used longitudinally and transversely in ordinary cases not later than three weeks after the onset, and at the same séance at which galvanism is used for the purpose indicated the nutrition of the muscles of the paralyzed members should be kept from undergoing the atrophy of disuse by their daily exercise with a mild interrupted current; and if the muscles are kept in a state of good nutrition, and if the pathological products that surround the hemorrhagic focus are promptly removed, we shall get much better results than is possible by any other method which we may adopt.

I can also bear testimony to the advantage of cerebral galvanization by these mild currents in certain of the psychoses, especially in acute cases of melancholia and confusional insanity.

That organic spinal cord disease that gives the most striking results from the use of electricity is poliomyelitis anterior acuta. If the paralyzed muscles can be made to contract by a current that the child can be induced to tolerate daily, and if this muscular contraction is accompanied by the use of massage and by attention to the general health, using such restoratives as

* On Failure of Brain Power, 1898.

may be indicated, and paying proper attention to elimination, we will obtain better results than can be otherwise secured. The difficulty in the treatment of these cases is to induce the mothers of the children to continue the treatment for a sufficient length of time. The progress must necessarily be slow, but where muscles will respond to currents of moderate amperage, the restoration of power is always a possibility, and failures result from the want of earnestness and persistence on the part of the doctor or the friends of patients. This treatment, to produce the best results, should be used very early in every case.

The most brilliant results in the treatment of diseases of the nervous system, I think, are had in the cases of multiple neuritis. Here the continuous current should be used immediately, when the diagnosis has been made, to the nerve trunks, using, if necessary, on account of pain, cocaine by cataphoresis. The positive electrode, without cataphoresis applied with gentle currents, four to five milliamperes to the nerve trunks, will always produce sedation, and this sedation, I believe, is also accompanied by physical effects in the direction of limitation of the degenerative process. When the excessive pain has subsided, then the current, used interruptedly to the atrophied muscles of such strength as will produce contraction, will begin the work of restoration in their nutrition. In thus applying the current to the atrophied muscles, we must always bear in mind that too strong a current, or too frequent application to a particular muscle or group of muscles, may result in exhaustion, so that in the beginning of the treatment a single muscular contraction of each muscle or group of muscles at each séance is all that is necessary, and if this treatment is accompanied by mild alteratives and tonics, surprising results may often be had in the most unpromising cases, and this often after a long persistence of the disease. I should not hesitate to treat any case of multiple neuritis in which muscular response can be had by currents of moderate intensity with the positive assurance of benefiting the patient. What is true of multiple neuritis is also true, to a very large extent, of peripheral paralysis generally.

Facial paralysis of peripheral origin is a most encouraging condition to treat. We should begin by using a current of low amperage, stable, using the positive electrode over the

peripheral distribution of the nerve in the face, and the negative at the nucha. After a week or ten days of such daily treatment the electrical exercise of the muscles should be commenced, and a current of just sufficient amperage should be used to produce gentle contraction, and a single contraction is enough at each séance. This treatment should be supplemented by daily facial massage and by the use of an artificial muscle made by using a hook-shaped piece of hard rubber, placed in a corner of the mouth, with a flexible rubber band attached to it, and passed around the ear of just sufficient tension to counteract the muscular activity of the other side of the face.

Various neuralgias, facial, sciatica, are benefited by the continuous current, the anode placed over the nerve, and the negative at any convenient point, and if there is no yielding to the current alone, comforting results will adways follow by the use of ten per cent. solution of cocaine by cataphoresis.

Exophthalmic Goiter.—A few years ago it appeared as though the surgical treatment of this neurosis might be the only proper treatment. The pioneers in operative procedure were so hopeful of results, and so enthusiastic in its advocacy, that medical treatment seemed to be malpractice, but with a mortality now on record of over seven per cent., with a proportion of cures not encouraging, we are justified in continuing those measures that experience has taught us will give a mortality of less than half this percentage, and a very large proportion of cures.

This consists in gradually increased doses of the tincture of strophanthus to control tachycardia, in intestinal antiseptics, including colonic flushing with normal saline solution to diminish auto-intoxication; rest in the recumbent posture for the first few days—absolute, then gradually modified until the patient simply goes to bed early, gets up late, and rests one hour at noon; abundance of easily digestible and assimilable food, and in the early stages of the case the daily use of cerebral galvanization, the large anode over the forehead, the large cathode over the nucha, a current strength of two milliamperes for five minutes; then a large anode over the nucha, and a large cathode applied to the thyroid, with a current strength of five milliamperes for five minutes; then as the third and last step, the cathode should be applied to the epigastrium, and the anode over the length of the spine, for five minutes.

Cataphoresis.—The advantage of cataphoresis in producing local anæsthesia for surgical procedures and in relieving localized pains is well set forth in the paper read by Dr. Gill at the last meeting of this association.* But there is another use of

* JOURNAL ADVANCED THERAPEUTICS, Vol. 22, No. 6, page 347.

this valuable method that I wish to emphasize, and that is the cataphoretic application of the iodides.

A stenographer and typewriter, whom I had treated a few years before for neurasthenia, consulted me about her right hand that had been disabled by being caught in a heavy door a few weeks before. The contusion was a very severe one. She consulted one of the leading surgeons of the city, and he assured her that no bones were broken, and that there was no dislocation. He ordered her excellent treatment, and promised speedy recovery. When she called on me, about six weeks after the accident, the movements of the right wrist and fingers were limited, and she was thereby incapacitated from work. An X-ray examination of the member demonstrated the correctness of the diagnosis, and I told her that the limitation of motion was due to inflammatory exudates, and that they could be removed by iodine cataphoresis. The treatment was commenced, using two sponge electrodes, one on the palmas and the other on the dorsal aspect, about three inches by six inches, to which we applied the liquor iodi compositus, reduced about one-fourth, and a current of five milliamperes, with daily séances, ten minutes' duration, reversing the current once at each sitting. The exudates soon began to disappear, and gradually the movements became normal, and these were encouraged by daily massage and passive movement. After the first week the treatments were given every other day. In four weeks she resumed her work.

Discussion.

Dr. Almerin Webster Baer, Chicago, Ill., stated, in opening the discussion, that he thought that this paper was written along proper lines. The subject of medicine and its adjuncts had been one of rainbow-chasing, to these many moons, the tried and occasionally used remedies have been neglected and forgotten in the race for the fountain of youth and miracles.

Faith and credulity, he held, were only possible when brain matter is at a discount. The continuous current was his special delight, he stated, in using electricity as a remedial agent; because from it he could get results that were lasting, and it reaches the innermost cells of the nerve tissue, acts physiologically on the pathologic cells, increases the metabolism of the active as well as the laggard, continues its forceful properties for days after use and is not dissipated into the earth the moment the patient steps off the insulated platform, as do most of the high-potential currents, which are most superficial in their modes of action and reception.

He had used the high-potential current, and with success; but as an adjuvant to the continuous current.

Dr. Brower had sounded a note of warning concerning the source of current. The 110-volt current with a lamp in series,

as furnished by the instrument makers, was considered as being almost as harsh as the induced current produced from cells. On the advice of an electrical engineer, he put two resistance coils in circuit (made of No. 36 German silver wire) whereby the 110 volts was cut down to 63 volts or 43 volts, whichever it was desired to use, with most satisfactory results, the current was always the same strength, and did not require looking after as a lot of chemical cells, which always require time, and if not carefully watched, will act like a static machine in dog-days. The plate with its carbon rheostat and milliampere meter is not an ideal instrument, but is to the induced current what ergot is before and after labor.

When a pulsating current was required, putting the vibrator in action would give results that at times bordered on the marvelous, when used after the direct-current treatment. Good results from direct current simmers down to a matter of technic, which cannot be learned from books entirely.

Special emphasis was laid on what Dr. Brower had said concerning the lack of inquiry when the continuous current has been used fairly and judiciously; more so, the doctor stated, than when any drug of value has been used without caution.

Another point, and one to which Dr. Baer called special attention was the gynecological phase of the continuous current, and in this branch of therapeutics he considered it invaluable, as nothing would reduce a connective tissue hyperplasia of the pelvis except the continuous current, or time, and plenty of it. The removal of the uterus and adnexa would sometimes relieve the excruciating pelvic neuralgia, until the patient has time to die of ennui or cussedness; but unless the patient has a pus pocket or a disease besides an inflammatory one, the knife is the worst treatment yet devised, because it can neither cure nor palliate.

Dysmenorrhea could always be relieved, and almost always cured by this modality, and it is seldom necessary to go into the uterus to give relief in the case of a virgin, although at times that might be needful for a radical cure. A large pad over the lumbar region and a smaller one over the uterus from 10 to 15 minutes, with the amount of current easily stood by the patient, and the doctor stated that he always allows the patient to be the judge of the amount of current used, as some are more susceptible than others, and will receive more at one time than another, depending to a great extent upon the physiological condition. In the continuous current we have an agent capable of reaching every plexus, nerve or nerve filament in an animate organism, and the reason why it is not more used is probably because some other things are not so complicated. Furthermore, this current is of special value in treating that dreadful disease, which has been increasing the mortality rate so frightfully in the past few years—pneumonia.

This current also gave the best possible results when it was desired to give a bronchitis or pleurisy patient the best treatment, quickest and most permanent relief.

Dr. George Betton Massey of Philadelphia, Pa., stated that he had been unfortunate in not hearing the entire paper, but that portion which he had heard was exceedingly interesting.

The doctor stated that in his younger days, while associated with a distinguished neurologist in the treatment of a case of infantile paralysis, he was told to instruct the mother how to use the interrupted current. While he had not had much experience at that time, he thought that that was not the proper current to apply to muscles that would not respond, and he accordingly told the mother that in his opinion, what she needed was the constant current. Owing to the prejudice of those times, this advice did not do his reputation any good, but in view of the present knowledge of the subject, his views at that time were correct.

Special attention was called to the use of the constant current in the treatment of multiple neuritis, and in this, the speaker stated that he could confirm what the writer had said. A case came to him for treatment. The man was a saloon keeper, who could not make change, nor handle glasses over the bar. He had been turned down by the other neurologists of the city as incurable. The constant current was used, and a prompt recovery resulted.

While there is a great deal in technic, the speaker stated that his technic changes from year to year. His methods are different, especially in this class of cases.

The constant current he found of especial value in the treatment of facial paralysis, and in treating facial paralysis, he placed an electrode with about the area of the thumb on the face, and then turned on what the patient would stand, from 3 to 5 milliamperes, and by this technic, he was able to treat the patient from 3 to 5 minutes.

Dr. Charles Rea Dickson, Toronto, Ont., Canada, said that there were potentialities, other than this, which were attracting the greatest attention, and he was therefore very much gratified, when the President, in his address, stated that we must keep first principles in mind, and he was also much pleased with Dr. Brower's remarks along this line.

Personally, he was using in his practice, the very latest developments in the field of electro-therapy, including the Finsen light. He stated, however, that he also uses the constant current, and uses it regularly, and felt that to give up the constant current would be giving up one of the most important remedial agents. He was also glad to hear the writer's remarks on the dynamo current, as he had been old foggy enough not to use the dynamo current himself, and he fully agreed with the writer in his conclusions. He thought that perhaps the reason that the

constant current is not used more is because men are depending upon the dynamo.

Dr. Morris Weil Brinkmann, New York City, said that he thought that the remarks of the different speakers had brought out points of value and interest. There was another phase to the question, however, which he did not think should be forgotten, and that was that the different modalities were different manifestations of the same energies. The foundation of all the currents, was, of course, the continuous current, and anything that may differ with that is simply a modification of it in one way or another.

With reference to technic, the speaker believed that this should always be gone into fully, and in speaking of the area of electrodes, he believed that a more exact idea would be conveyed to hearers if the area of the electrode, as related to ohms of resistance, were given, and he thought also that we should speak of the milliamperes per square inch of electrode.

Speaking disconnectedly of volts or of milliamperes did not convey any precise idea, but the doctor thought that if the statement were made that a certain number watts or of foot pounds had been used, an exact idea of the amount of electricity administered would have been conveyed. He believed that in giving these treatments, we should have some sort of conception of the amount of energy in foot pounds that is being applied to the patient, and the foot pounds or watts, he believed should be given.

Dr. William Benham Snow, New York City, had been greatly entertained, and had profited by the papers of the President and Dr. Brower, because he recognized, as they do, the importance of the recognition and prescription of the best means at our command. As this subject is studied more and more, he believed, the student would feel the necessity of a more exact technic. The two important points to which he called attention were technic, and what was of more importance, the physiological action of the modality employed. These two factors should be kept in mind, as there is danger that we will not have a proper conception of the relation of the condition we are treating to the modality we are employing, and he felt sure that that was the cause of the failure of many who were employing this current, namely, the lack of technical knowledge.

He believed it important to keep before the student the uses, indications, and the effects to be expected, and Dr. Brower's results and attainments were certainly lessons to all who are interested in this subject.

In cases of anterior poliomyelitis, there is a central lesion, and the treatment to be effectual must be directed to the relief of this central condition, rather than devoted entirely to the relief of peripheral conditions, and in this connection, an im-

portant point to be borne in mind is that a neuron that is destroyed, is a neuron that is lost, and neurons that are lost are neurons that cannot be restored. In the treatment of these cases of anterior poliomyelitis, the speaker had used both currents, and requested the essayist to state whether in his judgment the continuous current should be used, stating that in his own opinion the static modalities should be employed. He had known this current to relieve, in a few days' time, a child that had been paralyzed for seven weeks.

Goiter, the speaker stated, is at present treated by various methods, and he thought results that had been obtained show that this is an excellent field for electro-therapeutics. He believed that what is now needed is a more careful study of treatments so that the agent indicated may be used, and he believed that if the correct modality were used, more uniform results would be had by meeting the conditions. This is a field in which mechanical vibration is accomplishing good results.

He believed that success was not to be sought by holding to one remedial agent, to the exclusion of others, but by making use of the agent best adapted to the case.

Dr. Brower, in closing, stated that the paper was written for the purpose of carrying us back to first principles, and not for condemning anything that is new. While he made use of the high-frequency, static, and interrupted currents in his office with grand results, he desired that the members of the society should not forget the infinite power that reposes in the constant current. He was very much gratified with the consideration that his paper had received.

Speaking of the use of static current in the treatment of infantile paralysis, the doctor stated that while he doubted not that it was of great value, yet he had had such excellent results from the use of continuous current in these cases that it would require a great deal of promise to compel him to give up its use in favor of any other current.

While he agreed with Dr. Snow that a neuron destroyed is a neuron lost, yet, he believed that there are in the same cell group neurons that are undeveloped, than can be developed, and will aid in producing muscular contraction in neurons that have been entirely destroyed.

If given a child with infantile paralysis that will tolerate a current that will produce muscular contractions, that child can be benefited, and the doctor stated that he had seen large numbers of cases of this kind that had been treated with marked success. One of the cases he had treated was that of a child who had grown into a young lady, who is one of the most graceful dancers in his city. She had infantile paralysis in both legs. Her mother was a refined and scientific woman who carried out the instructions given her faithfully and intelligently, with the result that the child was completely restored.

THREE CASES OF INOPERABLE AND RECURRENT SARCOMA SUCCESSFULLY TREATED BY ROENTGEN RAY.*

BY GEO. C. JOHNSTON, M. D., PITTSBURG, PA.

Mr. President and members of the American Electro-Therapeutic Association:

I wish to present, for the consideration of this association, three cases of malignant disease, in which there is no doubt as to the correctness of the diagnosis, and where most careful eradication of the diseased tissue, by skillful and competent surgeons, had resulted merely in temporary relief, the disease again declaring its malignancy by the recurrence *in situ* of the growth; the abandonment and refusal of further surgical measures by the surgeons, and the willing surrender of the case to radio-therapeutic measures, followed by the complete recovery and restoration to health, of each of these patients, and the continued observation of this apparent recovery for a period approaching two years, with monthly examinations of each of the patients, and the failure to observe the slightest return of the disease in the original location or any indications of secondary metastatic deposit in any portion of the body. Uninteresting as these case reports usually prove, I feel that they deserve to be represented in some detail.

Case 1.—Mr. W., father of a physician of Pittsburg, Pa.; age, fifty-six; family history, negative; general health good up to four years ago, when some pain in and enlargement of the abdomen attracted his attention. The abdominal muscles, as he expressed it, seemed to be constantly cramping, and a multitude of hard globular masses in the abdominal wall became apparent. He suffered considerable pain and rapidly became cachectic. He fell off in weight, his appetite failed, and an examination of the abdomen, by his son and Dr. Adair, revealed the presence of a very extensive growth, involving the entire right rectus muscle and a large portion of the left. An operation was decided upon, and was performed by Dr. Langfitt, at the St. John's General Hospital, assisted by Dr. Adair and his son, Dr. W. The operation disclosed such extensive

* Read before the Fourteenth Annual Meeting of the American Electro-Therapeutic Association at St. Louis, September 14, 1904.

involvement of the peritoneum and omentum, as to preclude the possibility of a complete extirpation of the growth. Dr. Langfitt satisfied himself by removing the entire right rectus, which was simply a sarcomatous mass of yellowish débris, and a portion of the left rectus, and such other portions of the growth as seemed permissible. So much of the abdominal muscle was of necessity destroyed and removed, as to necessitate the immediate application of a large abdominal binder, which the patient must continue to wear for the remainder of his days. As soon as he was able to leave his bed following the operation, and from which he convalesced rapidly, he was brought to me with the request that I endeavor, if possible, to inhibit the growth of such portions of the tumor as had been permitted to remain at the time of operation. He was very weak, markedly emaciated, anæmic and cachectic, and suffering considerable abdominal pain. He was discouraged and disappointed, and I did not feel that there was much to offer him. In fact, the treatment was only undertaken at the earnest request of his son and Dr. Langfitt.

Treatment was given daily for two months, with a tube of high penetration, at a distance of 18 in., excited by a 15-in. Queen coil, vibrating interrupter, 7 amperes in the primary circuit, duration of treatment 10 minutes. The greatest care was exercised to prevent the occurrence of abdominal burns, which would have terminated the treatment, as the patient was in no physical condition to repair such a lesion. The abdomen was tanned slightly and the pubic hair disappeared. During three months the same technic was employed, treatment being given every three days, and during the fourth month treatment was given once or twice a week. At the end of this time treatment was suspended for one month, weekly examinations of the abdomen being carefully made. The pain had disappeared during the two months, the abdominal wall had softened, and there was no evidence on palpation of the persistence of any enlarged glands within the abdomen. The patient's color was good, the appetite excellent, general health good. He had gained thirty pounds, and he remains to-day in excellent condition. The most careful and repeated examinations by a number of surgeons having failed to reveal any evidence of any malignant disease.

Case 2.—Miss O., age forty-two, recurrent sarcoma of the

vulva. This patient in 1900 noticed a swelling and tenderness of the pubis, following a blow from the corner of a dining-table, swelling rapidly, extending downward into the right labia majora. The pain, which was constant, increased in severity until she was compelled to submit herself to examination at the hands of her family physician, Dr. Frederick, who at once recognized the nature of the trouble and advised immediate operation. The growth was removed as completely as possible by Dr. C. B. King, and an apparent cure was the result. Six months later the growth returned in the scar of the operation, and an examination of the first tumor having shown its malignant nature, a second operation was at once resorted to. This was followed by relief for a period of several months, when the growth returned with all the old symptoms, but this time characterized by great rapidity in enlargement and extension, and whereas the former tumor had to a certain extent been encapsulated and discreet, this recurrence involved the skin, subcutaneous tissue, periosteum, and could not be removed surgically without damage to the urethra, labia majora and minora, and the clitoris. Under these circumstances the surgeons decided that they had nothing further to offer, and suggested that she submit herself to a course of radiotherapy. In view of the undoubted malignancy of this growth, both clinically and microscopically, the treatment was undertaken with considerable hesitancy. A Queen self-regulating tube, set to back up a spark gap of $3\frac{1}{2}$ in., actuated by the discharge from a 15-in. Queen coil, vibrating interrupter, plain primary, taking five amperes in the primary circuit, was employed. The tube was placed at a distance of 15 in. from the lesion. Ten-minute treatments were given daily for three weeks. A lead screen, having an opening six inches in diameter opposite the lesion, was used to protect the abdomen and thighs. At the end of this time the pubic hair had disappeared, never to return. A mild degree of dermatitis was present which caused the patient some slight inconvenience. The pain in the growth had practically disappeared, and it had ceased to enlarge. A rest of ten days was given the patient, and a dusting powder of stearate of zinc ordered, and the dermatitis having subsided and being followed by a dark mahogany tan, treatment every other day, with the same technic, was undertaken for six weeks. At the end of this time the abdominal

screen was discarded, a fairly high tube with good penetration, carrying a half-inch spark on the cathodal side, was employed, and treatments twice a week, at a distance of 15 in., were given for two months. At the end of this time some vague abdominal pains which had given rise to a suspicion of pelvic metastasis having disappeared, the high tube was discarded, and a rest of two weeks given the patient. At this time there remained but two foci of disease, one the size of a lima bean, very hard and slightly movable, one-half inch to the right and one-half inch below the symphysis pubis, the other a thickening of the subcutaneous tissue, in the right labia majora. A Queen tube, sharply focused and rich in chemical ray (a picture tube, in fact, which would make a satisfactory elbow in one minute, with eight amperes and a vibrating interrupter), was now employed, placed at a distance of 10 in. from the vulva, and a first-degree X-ray dermatitis produced. This required six treatments. This dermatitis produced the first complaint from the patient, and she was obliged to spend the most of her time at rest for a period of a week, during which time she suffered considerable pain. This was the last treatment which she ever received, for, following recovery from this burn, every trace of the sarcomatous deposit disappeared, and there has never at any time been any indications of a return. Her general health is excellent and she is one of those pleasing assets, a grateful patient.

Case 3.—Mrs. R., referred by Dr. Mercur, with a history of three operations for the removal of a growth involving the entire upper chest, the suprasternal notch, and the left triangle of the neck up as far as the insertion of the sterno cleido mastoid. Her voice, from encroachment upon the larynx, was a hoarse whisper. The chin was fixed by a scar tissue, the head could be moved with difficulty from the involvement of the sterno cleido mastoid, and digastric. She suffered from paroxysms of dyspnoea, and carried the head in the posture and with the care seen in necrosis of the cervical vertebræ. A broad collar of ulceration, studded with shallow craters discharging a foul-smelling ropy pus, covered the root of the neck and chest. The edges of this ulceration were abrupt, thickened, undermined, and exquisitely tender. She suffered constant agony and was truly in a pitiable condition. Daily treatment, with a tube of low penetration, 15 in. coil, vibrating in-

interrupter, five amperes in the primary, for ten minutes, with the tube at a distance of 8 in., was followed by much relief from pain. Within two weeks the amount of discharge had noticeably lessened and the peculiar odor had disappeared. The pus became thin and sanious, the edges of the ulceration softened and declined, and it was necessary to proceed more slowly in order to limit the formation of extensive cicatricial tissue. The ulcerated area at the end of three weeks was let alone, save for the use of a wash of peroxide and application of an antiseptic dusting powder. The left side of the neck was now attacked daily with a tube of medium penetration strongly excited, and a burn of the first degree produced, with the result that the growth broke down beneath the skin and discharged along the sheath of the muscle at the opening in the suprasternal notch, several ounces of pus finding exit by this route. This was immediately followed by a considerable freedom of motion of the head. At no time was any protective used, save a little foil to cover the eyes and nose. Treatment was now resumed vigorously over the front of the neck and chest, with the result that the ulcerated area promptly cicatrized with the formation of a minimum of scar tissue, and she remains to-day after almost two years apparently free from any indications of a return of the trouble.

In none of these cases was the slightest difficulty experienced from auto-intoxication. None of these patients showed at any time any albuminuria. They each seemed to possess a remarkable degree of resistance to the destructive tissue effect of X-ray. They were hard to burn, and being burned reacted promptly. They were able to tolerate large doses of radiation for a considerable length of time. Their skins were active, their kidneys competent. In spite of the nature of the disease and its recurrence they were really favorable patients. In none of these cases was there an expectation of the result finally obtained. There seemed to be no factor which would justify such a hope. They each deserve credit for their own salvation, for they rendered faithful attendance, unquestioning obedience, they expected little and demanded nothing, but every effort put forth on their behalf was accepted with gratitude, and met with hearty co-operation. I present these cases because they naturally fall into a class which affords the fullest degree of affirmative evidence of the actual tangible value of the X-ray when properly administered in recurrent sarcoma. These cases were undoubtedly sarcoma. The first was a large, round-celled sarcoma. This is the diagnosis of the surgeons clinically, and of the pathologists. The second was a small, round-celled sarcoma, the third was a fibro-sarcoma. In none of these cases is there the slightest doubt as to the nature of the growth. The surgeons and pathologists are men of recognized ability, and their diagnosis is entitled to respect.

Second, these cases were recurrent. The first was necessarily incompletely removed. The second was recurrent after two removals, the third was recurrent after three removals.

Third, each of these cases made a perfect recovery, which recovery is permanent to the extent of two years.

Fourth, the treatment consisted solely in the application of radiation from an excited Crookes tube, at such intervals and in such quantities as has been demonstrated to constitute it a therapeutic agent. It seems to me, therefore, from the history of these cases (if the evidence heretofore adduced shall be the truth, free from exaggeration, enthusiasm, or prejudice), we are justified in believing (and the burden must rest upon the other side) that in this agent, when promptly and intelligently applied, we have a curative measure that is entitled to the respectful attention of the medical world, that its development should be encouraged and the technic necessary for its employment perfected, its *modus operandi* detected, and the agent itself employed wherever possible for the relief of human suffering or prolongation of precious life, and the lasting honor of the medical profession.

Bijou Building,
Pittsburg, Pa.

Discussion.

Dr. William James Morton, New York City, said, in opening the discussion, that while he was glad to be able to meet with the Association, he was sorry that he was unable to be present at all of the sessions, and especially sorry that he had not been able to hear more of the paper, but his time had been taken up as chairman of the Section on Electro-Therapeutics of the International Electrical Congress, and in jury work at the Fair, in the Department of Electro-Therapeutics. While he had been absent, he felt that he had been working for the interests of the Association.

He had been one of the founders of the Association, and had never lost interest in it.

By preserving the entity of the Association, and by strengthening it, the speaker believed that the members would be doing the greatest thing possible for the profession at large, and in the matter of breaking down the unaccountable prejudice in the profession against the new, he had never heard a paper which was more certain to be effective in accomplishing that result. These three cases would be absolutely conclusive to any impartial mind that this treatment, properly applied, is doing more towards the cure of cancer than any treatment known at the present time. Not all has been learned about electricity yet, however, and electricity is producing cures that heretofore never have been known in the history of medicine.

When the reader of the paper opened his remarks in the modest manner in which he did, one would hardly have believed that he was coming out in the end with such brilliant results. The speaker did not feel that he could add anything to the method, procedure or technic employed by the writer.

The reader of the paper, however, had spoken of the high tubes, and the low tubes, while Dr. Morton did not believe it was a question of high tube or low tube, but the effect of that radiation upon the patient. In his own experience, he had always contended for the high tube, but he believed that the whole question was one of the effect upon the tissues, and he believed that with the high tubes there was less risk of dermatitis, and less risk of having to suspend the treatment entirely on account of burns. The greatest difficulty is the danger of the treatment being interrupted by dermatitis, and with a medium high tube, the treatment can be so managed that the dermatitis will not be very severe.

Cases had come under the doctor's observation, where the sarcoma had apparently been cured, but because of the general infection, the patient died from cachexia.

The speaker did not feel that he could add much to what had been brought out in the paper. He was very much impressed with the remarkable progress which these cases indicate has been made in electro-therapeutics, as a few years ago it would scarcely have been believed possible.

It was also greatly to our interest that these cases have come into our department of medicine.

Dr. Russell Herbert Boggs, Pittsburg, Pa., stated that he had the pleasure of seeing one of the cases, and was very much impressed by the wonderful results. He felt convinced that the doctor's technic was superior to his own in sarcoma, as he had no such brilliant results. Up to the present time he had been using the same technic for the treatment of both carcinoma and sarcoma, and from this meeting he had learned that his technic, that of a low tube, was most effective in carcinoma, but that the high tube was more efficient in sarcoma.

Dr. Charles Rea Dickson, Toronto, Ont., Canada, stated that he had had an interesting case of sarcoma. The case had been operated upon and the surrounding tissues excised; within two months it returned, and was again excised; at the end of two months it showed signs of again returning, when it was decided to have the case treated by the X-ray. It was treated by X-rays forty-eight times within one year, ray-erythema developed occasionally. The treatment was persisted in, and the symptoms disappeared completely, and, although the case was discharged about one year ago, the sarcoma has not shown any signs of returning.

Dr. Herman Grad, New York City, believed that in sarcoma

better results were obtained from radiotherapy than in carcinoma. In all cases, he believed that the patient should be exposed to the rays as thoroughly as possible, and a low tube should be used in treating any growth on the surface.

In the cases reported by Dr. Johnston there was no auto-intoxication, and the speaker believed that this was a very important point, as very frequently auto-intoxication will destroy the patient quicker than a malignant neoplasm will do it.

One of the special points in the technic was that no more tissue was broken down at any one time than the body could eliminate.

Dr. Johnston, in closing the discussion, stated that when he wrote the paper he had no idea that the discussion would be opened by Dr. Morton. The fact that he was engaged in this work, he stated, was probably due to Dr. Morton, who had taken a kind interest in him a few years ago.

Referring again to the second case reported, the doctor stated that at the time the case came to him, there was no doubt whatever but that it was sarcoma, but since the case has recovered, some doubts have been expressed. It reminded him of witnesses in a lawsuit, who stand ready to testify to a certain thing, until they go on the witness stand. However, the doubters do agree with him that it was either sarcoma or carcinoma. In the other cases, no doubt had been expressed.

In regard to tubes, the speaker stated that at the time he saw Dr. Morton, Dr. Morton was using a very high tube. Notwithstanding this fact, his own experience had taught him to use lower and lower tubes, until he was able to get the results. In using these low tubes, however, it was necessary to be very careful not to set up a dermatitis severe enough to interfere with the treatment.

Regarding technic, that had been learned against his will, largely from Dr. Boggs, of Pittsburg, and it took about two years to learn it, because it was against all of his ideas and principles.

The results were very flattering, but they were not reported simply as being three cases of sarcoma that he had cured, but three cases which he had been so fortunate as to find that could be cured. He also had eight or ten cases that could not be cured. Sometimes sarcomas are found that can be successfully excised.

Another point of great importance was the fact that in all of these patients that recovered, the skin was active, and the kidneys were active.

His own father was discovered to have sarcoma, the condition being almost identical with one of those reported in the paper, but he was an old man, his skin inactive, kidneys weak, and two radiations showed that the rays would kill him if continued.

THE MODERN TREATMENT OF STOMACH TROUBLE.*

BY H. H. ROBERTS, LEXINGTON, KY.

It is only within the last few years that special attention and special treatment has been devoted to the stomach. Our forefathers were in the habit of treating stomach disorders principally by fasting, and the way of medication was usually a calomel purgative or a blue mass pill, followed by some form of pepsin, to which there was possibly added a few drops of tincture of *nux vomica*, or at other times possibly hydrochloric acid, gentian, quassia, rhubarb, and other bitter tonics. In other words, until the last few years the treatment of stomach disorders was confined wholly to symptoms. To Ewald, Kusmal, Rosenheim, Fleiner, and other noted European scientists we owe much for their study and treatment of this important organ. From the introduction of the stomach tube by Kusmal there was presented a new method of studying gastric disorders. At the present day men who are devoting special attention to these disorders do not rely upon symptoms but a scientific and careful analysis of the gastric contents and a careful examination of the stomach as well as the entire body. Not only has this study brought about a method which has almost reached perfection in diagnosis, but various mechanical devices and other methods have been introduced so that it is now possible to treat the stomach locally.

I regret to say that the treatment of stomach disorders like many other new therapeutic measures has been greatly abused, and in many cases enthusiastic and inexperienced workers have done more harm to the special work of stomach disorders than they have done good.

Experience is necessary to thoroughly grasp the true meaning and use of any one thing; however, the most experienced prefer to share responsibilities with someone who has given the matter more exhaustive study than himself. There are always two ways in which a special and scientific treatment can be utilized—the blind and mechanical and the conservative and intelligent. In the former instance, the user of an instrument or treatment follows certain rules laid down either in

* Read before the Kentucky Valley Medical Society at Torrent, Ky., on June 16, 1904.

books or in the imitation of others; in the latter case, the user is constantly verifying, modifying, watching results, selecting cases for treatment, and using that care and good judgment which is ever essential to the scientific achievement of success.

Enthusiastic and careless followers of many lines of treatment abuse them so much that either the patients are prejudiced against the use of them, or more frequently irreparable harm is done by their use. Possibly there is nothing in the treatment of to-day of gastric diseases which is more abused than gastric lavage. Many use it because it has been recommended, others because of its moral effect on the patient, and still others because they do not know anything better. This craze has reached the laity, and we find patients buying their own tubes and not only washing out their own stomachs, but even their friends' and neighbors', greatly to the detriment of all. However, this is not the most deplorable condition of affairs, for the patient does not know any better; but take the operator who washes all kinds of stomach disorders without regard to physical examination or chemical analysis, and the therapeutic results of such treatments are not very flattering.

We must admit that the act of washing a patient's stomach has in many cases a wonderful effect; he is amazed at such an extraordinary trick, and relates the incident with a most graphic description of how the doctor ran a foot and a half of gum tubing down his esophagus. So important and essential to stomach treatment has the laity been led to believe the use of the stomach tube is, that I frequently find that they inform me, even before an examination has been made, that they have had their stomachs washed. Other members of the laity will not complain of their stomachs until the last minute, for they fear that horrible gum tube. In many cases of acute gastric disorders washing of the stomach is almost indispensable, and much good can be done and very great comfort given to the patient. Consider the lamentable effect of filling and the over-distention by the use of large quantities of water in chronic cases, such as gastrotroposis, gastrectasis, gastrohelcosis, erosions, etc. Could there be anything more harmful than thus adding insult to the already congested and inflamed tissues by this excessive weight of fluid, lacerating and stretching the tender fibers, producing in many cases numerous small hemor-

rhages of the mucous membrane, and causing a shock to the nerve-supply of this important organ?

It is in these chronic cases in which the use of large quantities of water produces so much harm because of the already weakened condition of the organ. I recently saw a case where the patient said it took a gallon of water to fill her stomach, and the doctor had to use an extra long tube, as she had such a large stomach. Doubtless fluid was added until the stomach rested upon the symphysis pubes, and could go no farther.

Gastric lavage is seldom required, and most certainly never as a routine treatment. It is true that the great advancement we have made in the knowledge of gastric diseases is due to the introduction of modern technique, but that which may be indispensable from a diagnostic standpoint may become a dangerous thing when used as a routine treatment. Within the domain of medicine to-day I believe there is nothing which is more abused than the stomach tube. The tube is contra-indicated in all constitutional diseases even for diagnostic purposes, such as heart disease, especially those in which there is defective compensation, myocarditis, angina pectoris, fatty heart, especially the advanced stages, aneurism, recent hemorrhages, such as pulmonary, gastric, vesical, apoplectic, renal, rectal, etc.; pulmonary tuberculosis, cerebral hyperæmia, advanced cachexia, in the continuous fevers, typhoid, remittent, etc.; ulcer of the stomach, carcinoma, especially of the pylorus, if there is coffee grounds in the vomiting; also in all those cases where the gastric affection is secondary to some more important primary disease. Therefore, the routine washing of the stomach for any and all kinds of stomach disorders is not only unscientific but obnoxious and positively harmful, and I cannot condemn such use of a valuable instrument in too strong terms.

Penzoldt reports a case where washing of the stomach had been arranged for the following morning. For some cause the patient did not come. That evening the patient died from a rupture of an aortic aneurism into the esophagus, doubtless saving the doctor's reputation and his chagrin.

In some cases where there are large quantities of material in the stomach, washing to remove this material preparatory to further treatment is essential, but never as a cure. Injury is not only done to the muscles and nerve tissues but also to the glandular supply.

In cases where large quantities of mucus are present the suction syringe will suffice; water will not remove the mucus, but increase the flow by its irritating effect upon the stomach.

Where there is blood present in the return wash it shows that either there is some lesion present or some injury has been done by the tube. In those cases where it is necessary to wash the stomach a specially devised tube should be used with an outlet and an inlet tube, so that the stomach can be thoroughly cleansed, but never at any time have an excessive quantity of fluid in the stomach.

Another method of treating stomach disorders is by the use of the gastric spray. With this instrument medicated fluids may be brought into direct contact with the stomach and carefully and systematically sprayed over the mucous membrane without the deposit of a concentrated or excessive amount of medication in one place. This, of course, should only be used after the stomach is thoroughly cleansed.

Another method of applying medication is by means of the powder blower. In this way lesions of the stomach, ulcerations, erosions, etc., may be directly treated.

Another method of treating stomach disorders is by means of the electrode. By this means electricity is brought into direct contact with the diseased portions of the stomach, not only bringing direct stimulation to the muscular fibers of the stomach and the nerve supply, but to the glandular system as well. And quite recently by this method electric massage has been introduced directly into the stomach. High frequency electrodes have also been so constructed that we can introduce this valuable therapeutic agent into the stomach, and obtain results in conditions which until now have been but little benefited by other treatment. For using a high frequency current in the stomach, I have had made a special electrode covered with rubber. The wire leading from the high frequency coil to the electrode is covered with the specially constructed insulation. The method of employing it is as follows: The patient should drink a few glasses of luke-warm water, mildly saline. An electrode is applied on the outside over the stomach, and the other internally, and the Oudin current is employed. This method is especially useful when it is sought to obtain the local effects of a current of high voltage.

Electricity in various forms can be introduced into the

stomach with as much safety as it can be used in any other portion of the body.

The modern treatment of stomach trouble resolves itself into first, that which is most important, a diagnosis of the condition, and this is only made possible by the new aids to diagnosis. With the tube we are able to remove the contents of the stomach and make a careful and thorough analysis of the extracted secretions. In this way we can obtain knowledge that would be impossible in any other way.

Transillumination of the stomach by means of the gastrodiaaphane affords valuable aid in the examination of the stomach. In this way we can determine the upper boundary of the stomach when we fail by percussion to determine the difference between the stomach and the intestines. By this method we can map out the position and the outline of the stomach and liver. It is of the utmost importance in dilatation and prolapse, the recognizing of tumors, and the thickening of the anterior walls, etc.

The X-ray I find of untold value to me in diagnosis of stomach troubles. With capsules which I have had made especially for this purpose I have not only been able to study the motility of the stomach but to follow the capsules at intervals throughout the whole alimentary canal.

After the diagnosis has been made the various mechanical appliances which I have mentioned will suggest themselves. Medication I do not believe should be given as much prominence as other methods in treating these cases. There is usually some derangement of the secretions, muscular tone, or nerve supply that brings about this condition. Not infrequently remote organs of the body have a direct influence on the stomach. Version-flexion or displacement of the uterus frequently produces constant and uncontrollable nausea, the removal of the cause stops the nausea. A beginning phthisis frequently announces its presence by stomach disorder, a chronic nephritis often shows the first symptoms in the stomach. The earliest symptom of tabes is found in characteristic symptoms of the stomach, and in various other diseases we have the patient complaining of the stomach only. It is, therefore, of the greatest importance that these conditions be recognized if we are to relieve the stomach conditions.

The essential feature of the treatment of stomach disorders

is the diagnosis, and we should not only be able to diagnose whatever disorders have direct connection with the stomach, but to diagnose whatever condition may come from other parts of the body.

Dieting is of value in stomach treatment only from the fact that by a proper and well selected diet we are able to adapt food to the most healthy part of the alimentary canal and thus give the patient strength and nourishment while the diseased condition is being corrected. There is nothing truer in the treatment of stomach disorders than that old saying, "It is often as important to know what kind of a patient the stomach has as to know what kind of a stomach the patient has." Unless the patient is willing to deny himself many of the luxuries of life and follow directions carefully and persistently we are often disappointed in results. Dieting does not necessarily mean the giving of small quantities of food but the giving of the proper kind of food. I frequently put patients on a restricted diet that is adapted to the most healthy part of the alimentary canal, and they consume much larger quantities of this special diet than if they were on an unrestricted diet.

The stomach is a faithful and patient organ. It will stand many insults and injuries, try hard to surmount a host of difficulties, but there comes a time when "patience ceases to be a virtue," and its owner must pay the penalty. The majority of stomach troubles are brought about through indiscretion in dieting, and how few of us realize that to tickle the palate with all the toothsome and attractive things we see, means pain, suffering, and shortening of life. It is not only the duty of the physician to correct the condition which the patient has brought about from an improper knowledge of dietetics, but to advise them the proper way to eat and the most wholesome food to procure. Correct the condition, remove the underlying causes, and our patients will in many cases be robust and happy.

In conclusion, I wish to impress upon you the importance of a correct diagnosis. This is the most important feature in the modern treatment of stomach troubles, and after we have arrived at the proper diagnosis, then the various treatments that are adapted to the numerous disorders, we are able to arrive at conclusions and obtain results that are satisfactory to the patients and to ourselves.

X-RAY TREATMENT OF URETHRAL CARBUNCLE.

BY G. H. STOVER, M. D., DENVER, COL.

The X-ray is now so well established as a remedial measure in a large number of pathological states that one who devotes himself exclusively to this line of work would have too many interesting cases for a single paper if he attempted to go over the work done since your last meeting.

I therefore consider it more suitable, instead of a general paper, to speak of the treatment of a most intractable condition by a new method, I am not aware that any other radiologist has treated urethral caruncle by the X-ray.

This is a most painful and annoying affliction, and one that seems very apt to return after surgical treatment.

These extremely sensitive tumors, with a bright red surface, just at the meatus urinarius, are easily recognized, and no other similar condition in this region gives rise to so much pain. By this alone they may be differentiated from other affections of this locality, prolapse of the urethra, etc.

The fact that these growths are quite vascular led me to believe that the X-ray, with its well-known action in causing an obliterative endarteritis, should be a rational and scientific method of treatment.

My first case is that of patient No. 122. The tumor first appeared fifteen years ago, and the original growth and two recurrences have been removed by the knife. When this patient consulted me there was a tumor the size of a finger end, very red and tender and inclined to bleed easily. It was so painful that she could not sit in a chair comfortably. Twenty-five X-ray exposures were given, using a tube of medium low vacuum, at a distance of five inches from the growth, the seances lasting ten minutes each. The size of the growth diminished after the fourth or fifth exposure, and the pain became gradually less. When the patient discontinued treatment she had no more discomfort, the surface did not bleed, and it had taken on the appearance of the normal mucous membrane; there was still some thickened tissue present.

The other patient was No. 127. The tumor had been removed by the knife some six years previous to her visit to me; it soon recurred and had remained sore ever since, causing a great deal of pain in walking and during urination. Only six exposures were needed; as this sore was quite superficial, a tube of fairly low vacuum was used, at a distance of six inches, with ten minute seances, during a period of about three weeks; after the fourth exposure the patient stated that she had no more pain or soreness.

These results are of course very gratifying, but a considerable time must elapse before I will say that they have been cured.

SENSITIZATION OF LIVING TISSUES.

BY MARGARET A. CLEAVES, M. D.

It has been suggested that certain fluorescent and non-fluorescent substances, upon exposure to light energy, act as transformers. The author is convinced, in the light of recent studies and experimental work upon the part of a host of original investigators, that the better, and fully as illustrative a term, is that of "sensitization." The sensitized tissues are in truth made sensitive to rates of vibrational activity of oscillating light energy physically capable of greater penetration than those which act not dissimilarly upon normal or unsensitized tissues. By reason of this sensitization the action is not only much more energetic, but also much more deeply situated.

In the following pages are given the results of experimental work bearing upon sensitization (which has been referred to under the action of light energy upon bacteria), the conclusions of different investigators and also the hypothesis of S. G. Busck, of Finsen's Light Institute, as to the influence of daylight upon the action of quinin in weakening or destroying the malarial plasmodium.

It is very clearly shown by the mass of observed facts that it is the blue-violet and the ultra-violet which possess to a great extent bactericidal power, and the reason for the great difference between their action on the one hand and that of the longer, slower, and less refrangible frequencies on the other, must undoubtedly be due to the absorbing power of the former as against that of the latter, for the stronger the absorption the greater the fixation of energy and action. The manner of the transformation of the absorbed frequencies depends upon the periodicity of the swing of light corpuscles or rate of vibration. Corpuscular disturbances transmit energy from an active phase of matter to a passive or receiving non-vibrating phase. This transmitted energy in the case of the very rapid corpuscular disturbance of the short and high frequencies gives rise to a chemical process in the protoplasm of the bacteria, which causes their death; while transformation of the energy of those corpuscular disturbances of longer and slower frequency into heat or some other form of energy takes place, which under

the given circumstances is carried off without harm to the bacteria.

The absorption of light as well as the mode of transformation depends not only on the physical nature of the frequency, i. e., its length, periodicity, and amplitude, but also upon the properties of the substance by which it is absorbed.

By altering the properties of the substance, there will result a change in the action of light energy on said substances. It follows, therefore, that if in any way it is possible to alter the properties of the bacterial protoplasm, or perhaps only the surrounding culture medium, without thereby killing the organism, there would be established a condition by which it would be possible to obtain a different action from the usual one on the bacteria by the different frequencies of the spectrum. If this could be done for bacteria, it would be equally good for all living organisms, animal as well as plant life.

Sensitizers in Photography.—Vogel* in 1873 showed that by the addition of certain substances the so-called sensitizers to the ordinary photographic bromide-silver-gelatin plates, the latter can be made sensitive to the rays or frequencies of the spectrum, which before only had a very small action, or perhaps none at all; and he succeeded in producing plates, which were as readily influenced by red and yellow frequencies as by those of greater refrangibility (color sensitive ortho chromatic plates).

This discovery of Vogel has been extensively made use of in photography during the past thirty years, but no satisfactory explanation of the phenomenon has been found. It is not yet decided whether it depends on different conditions with regard to absorption or an alteration in the manner of transformation of the energy of the frequencies in question.

Certain biological phenomena have been considered analogous to photographic sensitization.

Among the fluorescent coloring substances there are several, of which chlorophyll is the most common, which are of very decided importance. These coloring substances are, according to Busck, to be considered as sensitizers analogous to that of Vogel, i. e., substances which only transmit the light energy to the coloring matter of the leaves, without themselves taking

* Quoted by Busck, *Lichtbiologie*.

any direct part in the taking up of CO₂, or the giving off of oxygen.

In the 70's, Englemann* drew a similar parallel, and he showed experimentally that the maximum activity with reference to the separation of oxygen is to be ascribed to certain frequencies according as the chlorophyll of the plant in question contains this or that coloring matter.

At the International Botanical Congress in St. Petersburg in 1884, the same thought was brought out by Timiriazeff,† who asserted that there was a perfect analogy between the significance of the chlorophyll with regard to the carbonic acid assimilation of plants and that of the colored sensitizers in the photographic process. According to the experiments of Becquerel, 1874, chlorophyll also possesses sensitizing action on photographic plates.

"In the pharmacological laboratory in München, Tappeiner‡ and his pupils, Raab,§ Danielsohn,|| Jacobsohn,¶ and Ullmann,** have undertaken during the last five years a series of extraordinarily interesting experiments with regard to the action of various fluorescent substances in light and darkness. Raab found that infusoria (*paramoecium caudatum*) even in very dilute acridin solution dried considerably sooner when standing in the light than in darkness, and sooner in direct sunlight than in diffuse daylight. The same was the case in experiments with other fluorescent solutions. Raab sums up his experiments as follows:

"(1) The action of daylight is very harmful in experiments with acridin, phosphin, and eosin.

"(2) This depends on the production of fluorescence.

"(3) The most active rays are those which produce the greatest fluorescence.

* Quoted by Busck, *Lichtbiologie, Mitteilungen aus Finsen's Med. Lysinstitut in Kopenhagen, Heft VIII.*, 1904.

† Quoted by Busck, *Lichtbiologie, Mitteilungen aus Finsen's Med. Lysinstitut in Kopenhagen, Heft VIII.*, 1904.

‡ *Münchener Med. Wochenschr.*, 2 Jan., 1900, und 5 Nov., 1901.

§ *Zeitschr. f. Biologie* 1900, Bd. XXXIX.

|| Danielsohn über die Einwirkung verschiedener Akridinderivate auf Infusorien, Diss., München, 1899.

¶ *Zeitschr. f. Biologie*, 1901, Bd. XLI.

** Ullmann über die Einwirkung elektrischen Bogenlichtes auf Mikroorganismen in Gegenwart von Fluoreszierenden Stoffen. Diss., München, 1901.

"(4) It is evident that fluorescent substances have the power to transform the energy of the rays of light into living chemical energy.

"(5) It is evident that fluorescence also plays a part in the animal organism, though to a much less extent.

"In a later work Raab* says: Chinolin red and hæmatin solutions have the same action on paramœcium caudatum with regard to fluorescence as acridin and phosphin. The action of the non-fluorescent fuchsin and crystal violet solution on the other hand is not increased by light. He found further that sunlight had the power of causing localized necrosis (in the ears) of white mice, in whom previously eosin had been injected—a phenomenon which he is inclined to consider as a burn in consequence of the great absorption of heat rays. Raab appears to see in these phenomena not only an action of light, but a highly poisonous activity brought out by the light from the different fluorescent substances. He remarks, however, that no increase in toxicity takes place in the fluid, when this is first exposed to light, and later, after the addition of paramœcia, placed in the dark. Contrary to this, Ledoux-Lebard † found that the active rays decompose the eosin and produce a substance that is poisonous to the paramœcia.

Jacobson ‡ examined floating ciliated epithelium (from the pharynx of a frog) in various fluorescent fluids. The motion of the cilia ceased much sooner in the light than in darkness. A second experiment was made as follows: A subcutaneous injection of 2 cgm. of eosin in solution was made into a frog, which was kept in the dark 24 to 48 hours thereafter. Although the tissues of the frog were colored red, the ciliary motion was not affected. Jacobson thereafter prepared specimens of ciliated epithelial cells, and placed some in the dark and others in the light. In those standing in the light he noted the death of the ciliated epithelia after three hours, while those placed in the dark showed ciliary motion after twenty-four hours. After subcutaneous injections of 0.00015 pro gr. of body weight the frogs were seen to be strongly incited in direct sunlight. After six hours, paralysis of the hind legs occurred, and on the following day the animal was dead.

* Zeitschr. f. Biologie, 1902, Bd. XLIV.

† Annales de l'Institut Pasteur, 1902, No 8.

‡ l. c.

After an injection of 0.0005 pro gr. of body weight local muscular paralyses were found after two hours, but heart action continued about five hours longer. Frogs injected with the same amount of eosin, but kept in the dark, did not show any signs of paralysis, and continued to live. Even doses of 0.0002 pro gr. could be borne by the frogs without marked toxic symptoms when kept in the dark.

"By emptying the cavum cranii of frogs, and filling the cavity with paramœcium cultures, placing some of the specimens in the dark and others in the light, Jacobson found that light, even after passing through a layer of animal tissue, had the power to kill the paramœcia.

"While Tappeiner* compares these phenomena with those of photographic sensitization, with which we are familiar, Jacobson† explains the toxic action quite differently. He writes:

"(1) Light increases the toxic action of fluorescent substances on ciliated epithelia.

"(2) The action of non-fluorescent poisonous substances is not increased by light.

"(3) Non-poisonous fluorescent substances exert the same action on ciliary motion in the light as in the dark."

Dreyer regards the action of the substances mentioned as analogous to the sensitization of photographic plates. From his experiments Dreyer reached the conclusion that "by using certain sensitizers, micro-organisms and animal tissues may be made as sensitive, yes, even more so, to the otherwise inert though relatively strongly penetrating yellow and greenish-yellow rays, as they normally are to the strongly active but slightly penetrating chemical rays." As sensitizers, Dreyer ‡ used especially erythrosin (tetra-iodo-fluoresceinatrium). This coloring matter extensively used in orthochromatic photography proved to be especially active in these experiments.

Sensitization of Bacteria.—As the gelatin bromide plates grasp the waves of short and high frequency with which space is filled by the millions, and hold their energy fast, in particles of silver, so these investigators § have endeavored to utilize

* *Münchener Med. Wochenschr.*, Jan. 2 1900.

† Quoted from Busck-Lichtbiologie.

‡ *Mitteilungen aus Finsen's Med. Lichtinstitut*, 1904, Heft VIII.

§ *Schlesische Gesellschaft für vaterländische Kultur* by Professor Neisser

the energy of longer and slower wave lengths, green, yellow, and even red, by rendering the tissues *sensitive* with suitable substances just as is the bromide plate.

All accumulated evidence shows that the bactericidal frequencies and those exciting tissue reaction, i. e., blue, violet, and ultra-violet, or the most refrangible of the spectrum, possess the least penetrative power, while the less refrangible frequencies, green, yellow, and red, have the greatest penetrative power.

The question arose in the mind of Dreyer* of Copenhagen, as to whether living tissue does not comport itself as does a photographic plate, and if the same substances used for the latter will not act upon the former and render them sensitive to the green, yellow, and red frequencies of the spectrum.

The following experiments were made by Dreyer: cultures of prodigious, and also of the infusoria *nassulo* were placed in a small quartz chamber, cooled by a circulation of water, the liquid was sensitized by a 1-5000 solution of erythrosin, which by itself is without any action upon infusoria or bacteria. The concentrated light of a 30 ampère arc at fifty volts pressure through a quartz filter was utilized. To study the action of the different frequencies of the spectrum, he filtered the light successively through glass, solution of sulphate of nickel, of chromate of potassium, and of bichromate of potassium. The results are contained in the following table:

Filter	Rays acting	Time after which are dead			
		Infusoria		Bacteria	
		Sensi- tized	Normal	Sensi- tized	Normal
Quartz . . .	The whole spectrum including the ultra-violet	10''	100''	60''	80''
Glass . . .	The visible spectrum	10''	9'	10'	10'
Sulphate of nickel 5% . . .	Red, orange, yellow, green, and blue	10''	13'	10'	10'
Chromate of potassium . . .	Red, orange, yellow, and green	10''	70'	15'	More than 4 hours
Bichromate of potassium . . .	Red, orange, yellow	10''	110'	25'	More than 9 hours

and Dr. Halberstadter, Section of Medicine, Deutsche Medicinische Wochenschrift, Feb. 18, 1904. Reviewed by Stephane Leduc, Archives d'électricité.

* Mitteilungen aus Finsen's Med. Lichtinstitut—1904, Heft VII.

The action of the less refrangible frequencies of the spectrum upon sensitized infusoria and bacteria is very strikingly shown by the results of Dreyer's experiments.

A 30-minute exposure of a culture of prodigiousus to the quartz spectrum of a lamp 26 ampères, the non-sensitized bacteria were only killed in the ultra-violet; while in the cultures sensitized by erythrosin death is produced by the orange and yellow frequencies also. These have been rendered equally active with the ultra-violet by reason of the erythrosin solution in which the cultures were placed, and which has served to store the energy of the orange and yellow frequencies. In the doing of this a chemical action takes place just as with the silver of the bromide plate in photography, an action which is disastrous to the integrity of the micro-organisms. Dreyer* found that the animal tissues were also capable of being rendered sensitive to the action of the orange and yellow frequencies. This he established experimentally upon tadpoles, rabbits, and upon the human skin. With concentrated light acting through 1.25 mm. of skin Dreyer was able to kill in 32 seconds sensitized infusoria; but when non-sensitized under the same conditions death only ensued after 60 minutes.

Sensitized bacteria treated in the same manner died after twenty minutes, while the non-sensitized were still alive after eleven hours.

Thus it is shown experimentally that both bacteria and the tissues can by being covered with suitable media be rendered as sensitive to the longer, slower, less refrangible and more penetrating frequencies as they are to the very little penetrating frequencies of the ultra-violet. This action does not in any sense depend upon fluorescence; for there are sensitizing substances which are not fluorescent, and fluorescent substances which are not sensitizing.

There are, for example, fluorescent substances which absorb energy of radiation at the same degree of erythrosin, but they are not sensitizing—i. e., they absorb the energy of the more refrangible frequencies, but do not emit them at a lower or less refrangible degree of radiation. On the contrary they fix or store the energy. This means work done—just as surely as the impression made upon the photographic plate by the silver bromide, nor is there any formation of toxic material

* Mitteilungen aus Finsen's Med. Lichtinstitut—1904, Heft VII.

by the action of light upon the sensitized liquids. If such a liquid is exposed to the light first and the infusoria or bacteria placed therein, no lethal action follows.

The experiments reported by Dr. Halberstadter confirm at every point the researches of Dreyer, not only upon the sensitized infusoria and bacteria but upon living tissue as well.

Dreyer's experiments were extended to living organisms.

By injecting erythrosin solution into the spinal cord of frogs, or by local cutaneous injections in rabbits and men, he showed that the otherwise inactive frequencies of the spectrum may cause inflammatory phenomena in the same.

These phenomena of inflammation did not quite resemble, either macroscopically or microscopically, the characteristic light reaction, but they were plainly analogous. The differences seemed to depend on the depth to which the changes extended into the sensitized tissues, and to such an extent that thrombosis of the deeper vessels occurred. "If," says Busck, "this experimentation is correct, it would favor the theory which ascribes the above-mentioned phenomena to the direct action of light energy made possible by the presence of the substances in question; in other words, an analogy with the action of optical sensitizers on the silver haloids."*

On the other hand, Jacobson,* among others, has declared his belief in favor of the more toxicological explanation. He considers the toxic action of the fluorescent substances as the determining factor, even though in some instances the toxicity may be so small as not to be noticed when the action of the light is removed.

Jacobson concludes that "poisonous fluorescent coloring matters are inactive," and this is based on experiments with only one substance, viz., esculin; while his study of poisonous, but non-fluorescent substances only embraces fuchsin. His experiments suggest, says Busck, an extended study of the subject, but they do not prove anything in regard to all other non-toxic or non-fluorescent bodies. Busck notes in this connection that some experiments which he undertook after the above was in print, gave the result that the Koch plate cultures of bacillus prodigiosus were sterilized about seven times as quickly in concentrated light that had passed through a filter

* Busck, *Lichtbiologie*, Mitteilungen aus Finsen's Lichtinstitut Heft, 1904.

† l. c.

of 5 per cent. potassium chromate, when the culture medium (agar) was colored with a dilute fuchsin solution 1:5000 as when uncolored. Busck concludes that the question must, for the present, remain unanswered, whether death in the case is to be ascribed to the simultaneous occurrence of two injurious factors, the toxicity of the fuchsin and the bactericidal action of the greenish-yellow rays, or to the increased action of the light in consequence of the greater absorption. The writer believes on physical, not experimental, grounds that the latter is the true explanation, and that it is possible, as suggested by Busck, that the difference between the two theories depends on the fact that "light reaction" and "toxicity" are not clearly defined. It is simply a fixation of radiant energy, but not of those frequencies which are so well known by their action upon silver bromide. Let there be placed suitable media in the path of radiant and oscillating energy, and it meets cessation, the waves do their work not in this instance the very short and high frequencies of oscillating light corpuscles upon particles of silver, but the longer and slower frequencies of oscillating light energy upon substances placed in their path capable of being acted upon by them, erythrosin, for example, which leave their record and come to rest. In this instance the record is that of a deep-seated inflammatory action upon the tissues placed in the path of the light energy. In this way the energy is stored, and "there is no higher achievement of human hands than the storage of energy."

(To be continued.)



RADIOGRAPHY.*

BY HERMAN GRAD, M. D., NEW YORK.

(Continued from page 614.)

DEVELOPING THE PLATE.

There are many "developers" on the market, but the most convenient ones for a physician are those that are put up in small packages ready for use, by simply dissolving them in water. The so-called "Metal-Hydrochinone" developer is as serviceable a developer as any. The chemical comes put up in two papers like a seidlitz powder. These two powders are dissolved in four ounces of cold water. Hot water would dissolve the gelatin coating of the plate, and, therefore, no heat should come in contact with the sensitized plate. The powder having thoroughly dissolved, the solution is ready for the plate, and can be put into the tray. If a large-sized tray is used, two or three packages should be dissolved. The quantity of "developer" should be sufficient to cover the plate completely. In a tray for an 8 x 10 plate, 8 ounces of developer is quite sufficient. That means two powders. Besides the "developer," a "fixing" solution is necessary. The latter solution consists of saturated solution of hyposulphate of soda—known as "hypo." To a pint of cold water—add about five ounces of hyposulphate of soda crystals, dissolve thoroughly. This makes the fixing bath. It should be put in the tray, next to the tray with the "developer." The ruby lamp having been lit, and the room thoroughly darkened, the developing may be proceeded with. The plate is then removed from the envelope. Care should be taken to cover the plate with the solution with the first sweep, as otherwise the plate will develop unevenly, and damage the "negative." The length of time necessary to develop a plate will depend on many factors: on the degree of the exposure, the parts radiographed, the quality of the plate, as well as the strength of the developing solution. Some plates develop slower than others. The operator will have to gain personal experience on this subject, in order to avoid

* Advanced sheets of the chapter on Radiography and Radiotherapy to appear in "Conservative Gynecology," by G. Betton Massey, to be published by F. A. Davis Co., Philadelphia, Pa.

"over-developing" or "under-developing" his plate. But for a general guidance this much can be said on the subject: When the plate is first immersed in the solution it is white. Gradually, the shadow of the part exposed will appear, and that part of the plate not taken up by the shadow, will turn brown and then black. The part taken, however, still remains white. Gradually the white will fade and this part of the plate becomes brown also. When the shadow of the plate of the object radiographed becomes brown, and the sides of the plate blackish in color, then the plate is fully "developed." The plate is now removed from the "developer," and rinsed off in cold water, and at once placed in the "fixing bath." The plate now needs a little further watching. Although the film side of the plate has become brown, the back of the plate, or glass side, is still white. The plate must be kept in the "fixing" solution until this white background disappears and the entire plate, front and back, becomes brown. The plate now needs to be washed in cold water, to dissolve off the "fixing solution." This can be done by putting the plate in a tray filled with water, allowing it to remain in the water for one hour. At the end of this time the plate is removed and allowed to dry. The plate should now be protected from dust, as dust would adhere to the wet film of the plate. When the plate is dry, it remains a permanent record of the part X-rayed, and is called a skiagraph. From this plate any number of prints may be made on paper, but while the bone in the skiagraph shows up white, in the print the bone shows up dark. The developing solution, as well as hypo, may be used again, and these solutions will keep well in tightly corked bottles. Half a dozen plates may be developed in the same solution. After this, the "developer" will weaken, and should be discarded.

INTERPRETATION OF THE X-RAY PLATE.

Nothing needs more care and caution in radiography than the proper interpretation of X-ray pictures. Absolute familiarity with the normal X-ray appearances of the various anatomic parts of the human skeleton is necessary, before the interpretation of the pathological is permissible. The great majority of fractures will, of course, be easily elucidated from the Roentgen plate, but some radiographs of fractures will not

admit such a ready interpretation. If an X-ray picture shows up the fracture, nothing can be more positive in pointing out the injury, but if only one radiograph is taken of a part, and no fracture is shown, it does not mean that a fracture does not exist. An oblique fracture of the tibia, for example, may exist, and an X-ray picture, taken in an anterior posterior direction, may not show up the injury at all. Not so, however, if a lateral view is taken. In this picture the fracture will show up well. It is, therefore, necessary to radiograph an injury in at least two projecting planes. The plate, after it is developed and dried, should be carefully scrutinized, and the relation of parts studied. The utmost care is necessary to bestow on reading a plate before coming to a definite decision about the case. The position of the parts while on the plates should be considered in interpreting the radiograph. Nor should it be forgotten that an X-ray plate may show decided anatomic defects, and yet the functional results of that bone may be very good. A faultily united fracture does not necessarily mean bad functional results. This is an important consideration, and must be remembered in interpreting X-ray pictures. Fractures, with little or no displacement, and with little or no subjective symptoms, as well as objective symptoms, when radiographed, and the best possible projecting plane of the fracture not caught, the plate may give great difficulty in reading it truly, and unless the utmost care is bestowed on it, such a plate may be misinterpreted. Vigilance, knowledge of the normal X-ray appearance of bone, and careful scrutiny of the well-developed plates, will doubtless avoid misinterpretation.

(To be continued.)



Editorial.

SOME ERRORS IN THE PUBLIC SCHOOL SYSTEM.

THE importance of liberal education is so generally appreciated by the intelligent that in the effort to cultivate habits of thought and intellectuality in the youth, there is a disposition too often on the part of educators to lose sight of the health of the student, which is of far greater importance in after years. For the child who is taught to think, and who is impressed with the importance of common things, is in after life more often better able to cope with the problems of life than the pampered and cultivated youth who is brought up nearer the centers of civilization. This is too well proven by a survey of the list of successful men that the world has produced to require any farther argument.

The boy or girl who enters life with a purpose and determination to know and to do, requires but the additional qualities of virtue and temperance to succeed.

The disposition so notable in our city schools to-day to force young minds into channels of thought beyond their years, instead of developing the best qualities of childhood, disposes to create an unnatural method of thought in the young mind, with a growing disposition to belittle the things which are of greatest importance to the individual in after life. For, after all, it is the power of little things, the study of the natural, and the gradual development of the mind which is only capable of appropriating so much of the things that properly belong to the age of development.

When we find our children forced to study English history and literature from its technical aspects, algebra, and advanced science at the age of thirteen, in any but a purely inductive method, it is forcing the mind to comprehend that which it is not sufficiently developed to appreciate. It seems to be the opinion of educators that education must be forced before the age of fourteen is passed, the time when the compulsory education ceases—that prior to that age the young mind should be forced to know things which may tend rather to create wrong impressions and pervert the aspirations and inclinations of the youth than to strengthen and cultivate qualities of virtue and contentment. It is not sufficient either that these students

be taught in the schoolroom, under our present system, but that the youth be *compelled* during hours when his time should be occupied in healthful recreation to read and study lessons for the following day. The ambitious child will suffer most. The system of markings, and the rebukes which are inflicted for failures, goad others less studious to greater effort as well, at the expense of the health of the child. That this is the general system in vogue is patent, and that the thought of the health of the child too infrequently occupies the mind of the teacher is apparent to the careful observer who best understands human nature—its possibilities and capabilities.

Another error at the present time of the public school system, especially in large towns, is the tendency to compel the young children to carry large bundles of books to and from school daily. The medical man whose opportunities permit him to examine these children, detects the effects of this mischievous practice. Misplaced scapulæ and curved spines, with undeveloped and overdeveloped muscles on opposite sides, are the common sequelæ of burdening the youth daily in this way. In the first place, it should not be necessary that the child take to his home more than one or two books at most, for his hours there should be occupied in some other way. The school hours are sufficient in all but exceptional cases for the application of young minds to such subjects, and the books, if they cannot be protected at the school building, in the seats of the student under the present system of management, had better be put under the eye of a watchman, and the children relieved of the burden which is constantly producing deformities of their little bodies.

The truth of this fact is so apparent to the medical man who is a father, that, as a body, it seems the duty of the medical profession to put a stop to these abuses.

* * *

FIFTEENTH ANNUAL MEETING.

THE fifteenth annual meeting of the American Electro-Therapeutic Association will be held in New York City on the 19th, 20th, and 21st of September, 1905.

LIST OF COMMITTEES.

The President, Dr. Emil Heuel, has announced the following Standing Committees for the ensuing year:

On Induction Coils and Alternators, Dr. Morris W. Brinkmann, Chairman, 54 West Ninetieth; Mr. John J. Carty, New York, N. Y.; Dr. Russell H. Boggs, Pittsburg, Pa.

On Committee of Electrodes, Dr. R. G. Brown, Chairman, Brooklyn, N. Y.; Dr. Francis B. Bishop, Washington, D. C.; Dr. Walter H. White, Boston, Mass.

Committee on Meters, Dr. Geo. Coffin Johnston, Pittsburg, Pa., Chairman; Dr. Robert Reyburn, Washington, D. C.; Mr. Chas. Felton Scott, Pittsburg, Pa.

Committee on Cataphoresis, Dr. G. Betton Massey, Professional Building, Philadelphia, Pa., Chairman; Dr. Marcus F. Wheatland, Newport, R. I.; Dr. Truman A. Pease, Norwood, N. Y.

Committee on Static Machines and Condensers, Dr. Wm. Benham Snow, 465 Lexington Avenue, Chairman; Dr. Harvey H. Roberts, Lexington, Ky.; Dr. Willis P. Spring, Minneapolis, Minn.

Committee on Direct Current Generators and Controllers, Dr. Wm. J. Herdman, Ann Arbor, Mich.; Dr. Fred. H. Morse, Melrose, Mass.; and Dr. Daniel R. Brower, Chicago, Ill.

Committee on Current Classification and Nomenclature, Mr. Wm. J. Jenks, 120 Broadway, New York, Chairman; Professor Elihu Thomson, Lynn, Mass.; Professor Samuel Sheldon, Brooklyn, N. Y.; Mr. Chas. L. Clarke, Borough Bronx, New York.

Committee on Radiant Energy, to Include Apparatus for Means of Diagnosis and Therapeutics, Light, and the Röntgen Ray, and Radioactive Substances, Dr. Margaret A. Cleaves, Chairman, Sydenham Building, New York City, N. Y.; Dr. Thomas D. Crothers, Hartford, Conn., and Professor Samuel Sheldon, Brooklyn, N. Y.

Committee on Arrangements, Dr. Morris W. Brinkmann, 54 West Ninetieth Street, New York, Chairman.

Dr. Wm. Benham Snow is appointed Chairman of the Committee on Exhibits for the Fifteenth Annual Meeting.

* * *

THE VALUE IN RADIOGRAPHY AND RADIOTHERAPY OF AN AMMETER WHICH WILL MEASURE THE CURRENT WHICH PASSES THROUGH AN X-RAY TUBE.

UNTIL recently there has been no means of measuring or determining the strength of current which passes into an X-ray tube, without which it has been utterly impossible to form any standard of method either in radiography or radiotherapy. Some of the recent writers, many of whom have been looked upon and followed authoritatively, have made the grave error of supposing that an ammeter by measuring the current that went into the primary of an X-ray coil, could be an index of the current which passes into the tube, have created wrong impressions in the minds of those who, from want of experience and knowledge of the character of high

potential currents, know no better. The absurdity of determining the quality of radiations that were produced in the great variety of coils that are on the market, to-day, with the various lengths and fineness of wire, etc., in this manner, is too apparent even to the tyro whose attention is called to the fact, to call for farther consideration; and yet, to the present time, this seems to have been the only way of determining except by the character of the rays as indicated by the fluoroscope, which, in the hands of an experienced operator, was fairly satisfactory.

The vacuum of a tube may be variously determined by the spark-gap—the measure or voltage or potential at which the first radiation appears, as the spark-gap is opened. The effect, however, of heating the gases within an X-ray tube during radiation, changes the character of the radiations, is lost sight of, but is a factor, nevertheless. With all these varying conditions to have an accurate means of determining the most important of all considerations, the milliamperage of the current that passes through the tube, is apparent to all. That such an apparatus has at last been produced, upon scientific principles, which is approved by many of the best radiographers, places the uses of the X-ray now upon a more accurate and scientific basis, and it is hoped that in the future with the reports of all cases which are published, a record will be made of the quality of the current employed.

The determination of the voltage under the present system of measuring by the spark-gap is one about which many errors of judgment are likely to occur. It is, however, the only means of determining the character of the vacuum of the X-ray tube. If a voltmeter can be added to the armamentarium as well as an ammeter without seriously affecting the current produced, another step forward will have been made. The difficulty of determining the spark resistance of X-ray tubes used with the various coils and static machines, is indefinite as a guide to the accurate conception of the current employed. With a suitable ammeter, however, the greatest difficulty is removed. The liability of imperfections in this apparatus and the necessity for absolute accuracy must be impressed upon the manufacturers. The past experience with milliamperemeters has demonstrated the necessity of absolute accuracy and standardization of apparatus, and so it will be to a greater degree with the meter that is to measure the fractions of milliamperes.

NOTE.—We note with satisfaction that the Archives of the Röntgen Ray, published by Rebman & Co., London, and 10 West Twenty-third Street, New York, has become an international publication, and that Dr. Henry G. Piffard is to be the American editor. Undoubtedly the scope of this valued periodical will be greatly enhanced and its field broadened by this arrangement.

Progress in Physical Therapeutics.

PHOTOTHERAPY.

EDITED BY MARGARET A. CLEAVES, M. D.

Professor Nils R. Finsen.

It is with profound and sincere regret that the department of Light Therapy records the death of Professor Nils R. Finsen. Although an invalid from an incurable heart lesion all his adult life, having broken down at the beginning of his career, he not only made for himself an enviable reputation but contributed fundamentally to the science of medicine, and was the means of relieving thousands of sufferers from disease and deformity. The use of light in the therapy of skin diseases, especially in lupus vulgaris, is certain, safe, precise, and scientific. The story of his life has often been told. It is one of tireless, unremitting devotion to the science of medicine, and the relief of suffering, despite his own invalidism. Professor Finsen was born in Iceland some forty-three years ago. He received his early education at the Faroe Islands, completing it at the University of Copenhagen, in 1890. During the last of his student life, he began his experiments with light, the outcome of which has been the establishment of the scientific light therapy of skin diseases. His first published work, on the influence of light upon the skin, appeared in 1893. This was based upon careful experimentation and observation and at once attracted wide-spread attention. As a result of his investigations, the Finsen Medical Institute at Copenhagen was established. In 1896, the municipal hospital at Copenhagen gave room on its grounds for several small buildings. From the smallest beginning, it has grown to its present proportions in Rosenvaenget, a pleasant suburb of Copenhagen, supported in part by private benefactions and in part by the Danish Government. Aside from the relief it has afforded and affords to the thousands of patients from all parts of the world, but especially from the Scandinavian countries, it has become the Mecca of dermatologists as well as light therapists, the world over. It is also the fountain head of scientific investigation into the relation of life, health, and disease to the source of all life, light as embodied in the sun. The publishing of his series of monographs was begun in 1899. In these the results of his researches, are most carefully recorded. In 1903, Professor Finsen received the Noebel prize from the

Norwegian Government. Light Institutes have sprung up all over the world as a result of his work. Finsen's name is known to and beloved by, not the profession only, but the people as well. His devotion to his work is said to have hastened his death. No less important than his precise scientific skin therapy, is his red-light treatment of smallpox. His scientific demonstration of the untoward action of the shorter, higher, more refrangible frequencies of the spectrum, in relation to an acutely inflamed skin, led to the exclusion of all the frequencies above the red in the treatment of smallpox, with the result, not only of preventing suppuration, disfigurement, and grave sequelæ, but of lessening the duration of the disease.

On the foundation which he laid, he lived to build a superstructure of undoubted integrity and permanence, and has given an impetus to the scientific investigation of the entire subject of light which will not end with his untimely death. In common with the rank and file of the profession which he adorned, he lived and died a poor man. Still unlike many, the value of his work was recognized by his country and he was afforded the means of carrying it on. His fellow countryman, Jacob Riis, has recorded as told him by Finsen, the latter's great temptation to utilize his discovery in private practice, rather than to devote it to the world. For the decision which followed upon his sleepless night of debate with himself upon the subject, the medical profession and the world are the richer and better. Finsen had the intuitive genius which enabled him to lay hold of and elucidate the unrecognized and unapplied, but none the less potent influence of light upon the skin. By his enthusiasm and genius, he attracted to his work a superior class of men, and the writer feels assured from their devotion to the cause as well as from their especially trained intelligence, that the same spirit will dominate the institution in the future that has governed it in the past.

CURRENTS OF HIGH FREQUENCY AND HIGH POTENTIAL.

EDITED BY WALTER H. WHITE, M. D.

The Treatment of Hemorrhoids and Allied Conditions by Oscillatory Currents of High Tension.—Lancet, July 2, 1904.

Mr. F. J. Bokenham gives an interesting summary of the results he had obtained during the past two and a half years. The author inclines, in the treatment of these affections, to the use of high vacuum glass electrodes, which, when excited, give out an abundant supply of X-rays. With metal electrodes

he employs a current of 450 to 500 ma., with glass electrodes one of 100 to 150 ma. The duration of each session seldom exceeds fifteen minutes, five minutes being the average. The following is a summary of the results in tabular form:

Nature of Complaint	No. of Cases	No. of Applications	Results				Remarks
			Cured	Greatly Imp'd	Imp'd	Fail-ures	
A—Simple fissure . . .	13	5 to 6	13	—	—	—	Prompt relief of anal spasm.
B—Acute capillary piles	25	4 to 11	14	9	—	2	
C—Recurrent cases of extero-internal piles without marked hypertrophic changes .	31	9 to 18	6	20	5	—	Improvement was almost immediate, and the associated constipation was at the same time relieved.
D—Chronic cases with indurated folds, but without marked venous congestion. .	12	7 to 15	—	6	6	—	
E—Large venous external and internal piles	16	12 to 30	—	—	7	9	Post-operative cases, the others old-stand cases, complicated by chronic gastro-intestinal disorders.
F—Post-partum piles, (partial prolapsus recti)	6	8 to 19	4	2	—	—	
G—Pruritus ani, with moist eczema of the parts . .	15	4 to 7	15	—	—	—	

New Apparatus for the Production of High-Frequency Currents.

When high-frequency currents are desired to operate electrotherapeutic or wireless telegraph apparatus, it has been found

undesirable to draw the required power from the public system. The difficulties of doing this are several: the high voltage set up by the interrupter throws a considerable strain on the insulation of the commercial apparatus connected to the system, endangering its operation, and it is difficult to construct transformers giving the required high voltage. To overcome these difficulties Messrs. D'Arsonval and Gaiffe have devised a system which is here described by M. A. Soulier. The first step was to modify the method of constructing the apparatus so as to allow a considerable increase in insulation. The causes bringing about deterioration were studied, and a method found for avoiding it. It was found that the Hertzian waves which are set up in the high-frequency circuit are set up also in all circuits connected to it either inductively or conductively. The voltage thus thrown on the system has a maximum equal to that which produces the spark in the interrupter, and this sets up between the neighboring wires of any windings differences of potential much greater than they have been designed to withstand. To damp out these oscillations, Messrs. D'Arsonval and Gaiffe connect a system of condensers and resistances between the transformer and the condenser in the high-frequency circuit. The resistances in this circuit damp out, by the heating effect, the high-frequency currents, and the condensers can discharge but slowly. Thus, the difference of potentials set up at the terminals of the transformer is much reduced, the amount of reduction depending upon the size of the resistance and the capacity of the condensers. The transformer then operates as an industrial transformer, the high-frequency oscillations not penetrating it. In searching for means to prevent arcing at the interrupter, it was observed that this arc is produced the more easily the greater the self-induction of the high-frequency circuit. By making a circuit with all conductors as short as possible, the inductance being reduced to a minimum, all difficulty from arcing disappeared. The diagram of connections for the circuits finally adopted shows a shunt circuit containing four condensers connected across the terminals of the transformer. In parallel with this shunt circuit is the circuit containing the interrupter and the two high resistances. The high-frequency circuit is formed of four condensers connected directly across the interrupter, the apparatus making use of this current being connected in series in this circuit.—Translated and abstracted from *L'Industrie Electrique* (Paris), August 25.—*Elec. Review*, September 24, 1904.

LARYNGOLOGY, RHINOLOGY, AND OTOLOGY.

EDITED BY W. SCHEPPEGRELL, A. M., M. D.

The Prevention of Hay-Fever.

The recognized cause of hay-fever being the pollen of certain plants, Mohr (Deutsche medicinische Wochenschrift, Jour. Amer. Ass., February 27, 1904) has carried out a series of experiments to prevent the inhalation of such pollen. He has devised a protecting device, with which he has successfully warded off the irritating pollen dust, both in himself and in all others who have used the device. It is a modification of the Schmidtuisen "nostril lifter" (Nasenflügelheber), but is completed by a filtering device. It is worn inside the nose, and causes no more discomfort than the wearing of spectacles. Mohr thinks that it has solved the problem, not only of absolute protection against hay-fever, but also for trades in which there is danger of inhalation of stone, dust, etc. By wearing the device a few days the sensitiveness of the mucosa was so much reduced that he could go without it for a time without inducing the previously inevitable attack of hay-fever.

Effect of Intubation in Diphtheria.

In investigating a series of cases intubated in the Willard Hospital and in private practice, Fischer (Archives of Pediatrics, Jour. Amer. Med. Ass'n, March 19, 1904) found that intubation produces no chronic cough; that the larynx was markedly tolerant, one of his cases having worn the tube for twenty-six days, and another twenty-five; that a proper feeding tube composed of rubber leaves no evidence of chronic inflammation directly traceable to it. There was no change in the contour of the thorax from intubation, although in the majority of the children in the first series as well as in the second there was decided rachitis, and 90 per cent. of the first series suffered from some form of chronic throat disease, such as tonsillar hypertrophy, adenoids or chronic pharyngitis, or all of them together. Fischer thinks that it is safe to assume that these conditions invite the infection. If children's throats are in a normal condition the risk of infection is reduced to a minimum.

Headache from Non-suppurative Inflammation of the Accessory Sinuses of the Nose.

Attention has frequently been called to headaches from pressure in the accessory sinuses of the nose. (Robertson, Jour. Amer. Med. Ass'n, March 5, 1904). This disturbance, not so rare as might be supposed, produces all the symptoms

of an empyema, except the discharge. The cause of this condition is stated by one author as being "from air pressure in the sinus." It is more probable, however, that it is due to the diminution of air pressure in the sinus. This diminution in pressure is caused by obstruction to the ingress of air to the particular sinus by closure of its natural orifice. For instance, the middle turbinal may be swollen from inflammation; the swollen body obstructs the sinus so that the cavity is shut off from the nasal chambers. The imprisoned air loses its oxygen from absorption by the blood vessels in the mucous membrane of the cavity. As a result of this absorption, the pressure on the mucous membrane is lessened by rarefaction of the air contained in the cavity. This causes a swelling of the mucous membrane in the sinus. If the opening becomes patent, the condition subsides, but in cases where the opening remains closed for some time, the cavity is encroached on (1) by the swelling of the mucous membrane; (2) by the pouring out into the cavity of lymph, and (3) by the engorgement of the mucous membrane itself by lymph.

The same condition exists here as in non-suppurative inflammation of the ear, caused by occlusion of the Eustachian tube. The symptoms vary according to the time the sinus remains closed. The case may present intermittent symptoms from the occasional opening of the sinus by the contraction of the tissues of the middle turbinate. The usual objective signs of empyema are absent. There is no mucopurulent discharge and transillumination gives a negative result.

Important Supplementary Methods after the Removal of Adenoids.

The necessity of removing adenoids is recognized by the profession, as the results have been so successful that they bear their own testimony of the value of this surgical procedure. The after treatment, however, has not received sufficient attention, and Fridenberg (*Archives of Pediatrics*, Jour. Amer. Med. Ass'n, April, 1904) calls attention to the necessity of supplementary measures for assuring the operative results, producing the habit of nasal respiration and correcting structural deformities due to abnormal functioning. The removal of adenoids does away with the obstruction, but does not insure nasal respiration, and training of the child is required. After the nasal respiration during waking hours has been established there will be no mouth-breathing during sleep, and he suggests indulgence in the habit of chewing gum for a period to assist in the reflex mechanism of keeping the mouth shut. It is not difficult to break the habit after its utility is past. He mentions a mechanical splint for keeping the mouth shut during sleep, thus aiding the treatment. The second detail to which the after-treatment should be directed is the

faulty arrangement and crowding of the teeth, the malformation of the alveolar arch, and the under development of the jaw and chin. Removal of adenoids in itself will not cure this, and he believes in the intelligent dental surgeon's intervention in such cases.

DIETOTHERAPY.

Reduction of Obesity. By K. Bornstein, Therapie der Gegenwart, Berlin.

The author's principles of treatment of obesity include a great supply of albumin and exercise. In this way he imparts vigor to the cells. The albumin need not be given in the form of meat; he also allows a certain amount of fat, following Epstein's teaching, to reduce the appetite for other foods. He also allows soups and beverages, as they are very well adapted to satisfy the hunger by filling the stomach, without giving much nutrient material. The principle is that the patient should undereat. By this treatment the obesity is reduced without the loss of albumin, while on the other hand, they gain considerably more albumin.

Rectal Feeding. By F. Reach, Centralblatt f. d. Grenzgebiete, Jena.

The author gives a review of 128 articles on the subject of rectal feeding, and comes to the following conclusions: The carbohydrates are absorbed by the rectum in considerable amounts and utilized by the organism, also the absorption is not complete. Fats are not taken up well, but the absorption can be promoted by the addition of pancreas. In regard to the albumin the various authors vary widely. The use of predigested albumin does not offer any advantage, especially as some of them seem to irritate the intestine. Casein and milk are not adapted for rectal feeding. The same difference of opinion exists in regard to the absorption of egg albumin. It seems that it is not absorbed in many cases. Therefore we come to the conclusion that the carbohydrates are much superior for rectal feeding. At best, however, rectal feeding is unable to supply the requisite amount of energy for debilitated patients.

HYDROTHERAPY.

EDITED BY CURRAN POPE, M. D.

The Modern Treatment of Typhoid Fever. By W. Gilman Thompson, M. D., New York City.

Of the treatment by cold tub baths there is little new to be said, but certain facts cannot be emphasized too often. The

Brand method, if employed at all, should be practiced with the courage of conviction, and not, as it so often is, in a half-hearted manner, and it should be applied as a stimulus to the nervous system, rather than as a mere regulator of body temperature. There are guides more important than the thermometer in typhoid fever, for this instrument only records the average or temporary balance of heat gain and loss. Excessive heat production, if accompanied by proportionately rapid heat loss, may give a low thermometric record, and yet the obscure abnormal metabolism producing the increase in heat may be working great havoc within the body, a fact which may, in some degree, account for the exceptionally rapid emaciation in a certain class of cases in which the thermometric record remains low throughout, for heat production in the body is mainly due to chemical processes, its loss to physical processes.

In severe cases typhoid fever becomes almost a disease of the nervous system, so profoundly does the latter suffer, as evidenced by the early intense headache, disturbances of special sense, restlessness and insomnia, and the later prostration and lethargy or delirium, subsultus, tremor, carphologia, and profound digestive and nutritional disorder. It is this group of symptoms which are best controlled by arousing the nervous system through the sudden shock of cold and mechanical shock of friction. It has been well said that the Brand treatment might be appropriately called that by "rubbing" rather than "tubbing." Only the full bath admits of thorough friction of the skin, for in it the patient floats, and there is easy access to all surfaces of the body, which cannot be obtained in like degree or facility by such compromises as the sponge bath, bed douche bath, etc. Moreover, the suddenness of the shock of cold resulting from the cold plunge is far more stimulating than the influence of the lukewarm bath gradually cooled, as first advocated by Liebermeister many years ago. If one desires a vigorous reaction against muscular fatigue after exercise in health, it is the cold plunge which best gives it, not a gradually cooled tepid bath, or sponging limited portions of the body at a time with alcohol and water. It is energetic friction which prevents shivering, keeps the skin in good condition, determines more blood to the peripheral vessels, and helps to divert the patient's mind from discomfort. A feature of no little importance is the increased depth of respiration obtained throughout the cold plunge bath, which antagonizes the tendency to pulmonary congestion and bronchial catarrh. As a more remote, but no less important, effect the digestion improves, and nutrition is maintained, so that extreme emaciation is rare, bed-sores and general furunculosis are practically unknown, the mind clears, the sensation of muscular soreness is alleviated, and the entire morale of the patient is benefited. Such are the real advantages of treatment by cold tub baths,

and the fact should be emphasized that they may all be obtained through the stimulation of the nervous system, even without immediate lowering of the thermometric record. In every considerable group of typhoid fever cases are a few in which the tub bath fails to reduce the body temperature, and I have seen it even rise a little after a bath, while the patient showed marked improvement in other respects. I have records of cases in which sponge baths produced as decided an effect upon the temperature alone as did subsequent "tubbing," but I have yet to see one in which their effect exceeded that of tubbing, and in the great majority of cases they fall far short of it in every way.

My present practice is to employ the tub bath at 75° Fahr. for fifteen minutes whenever the patient's temperature reaches or exceeds 102.5° Fahr., and insist upon gentle but continuous friction of the skin by two nurses during the entire bath. When first using this treatment at the New York Hospital some fifteen years ago, where I followed the practice of Dr. Peabody, we used water 10° or 15° Fahr. cooler, and previously we had given several years' trial to the Liebermeister graduated bath with poor results. Experience has taught the advantage of attention to detail in the treatment, and the fallacy of rigid rules. Not a few patients do better with a bath of eight or ten minutes' duration than in one of fifteen minutes, or they may do better with water at 80° Fahr. than at 75° Fahr. Alcoholic stimulation should be given fully twenty minutes before the bath, to admit of its absorption before the cold is applied—a matter of no little importance. Shivering is less if the back is rubbed first, and the tub should be large enough and full enough to admit of readily floating the patient; on no account should he be left to shiver for several minutes in the tub while the nurse is preparing the bed for his return; he should be promptly and thoroughly dried when taken out of the tub, and immediately left alone to sleep. These may appear trivial details, but anyone who has had personal experience in the tub realizes that they are not so, and they are often overlooked by those who state that they have applied this method of treatment, but gave it up on account of the patient's discomfort. I have met with far more complaint of the discomfort of cold sponge baths than tubbing among patients who have submitted to both.

No one claims that cold tubbing "cures" typhoid fever, or even aborts it, but it unquestionably fortifies the nervous system against the factors of the disease, and enables the patient to endure what is at best a long and tedious siege, with very much less misery. The only indications for its suspension are the occurrence of hemorrhage or pneumonia, when cold sponging should be substituted. The method most emphatically does not induce hemorrhage, or produce relapse, or

cause neuritis, or any other serious complication, as has been claimed against it. Its justification is shown in the remarkable unanimity of the hospital records throughout the country, which shows a mortality among thousands of cases averaging from 7 to 7.5 per cent. in each institution where the treatment has been faithfully carried out for years, as against a previous death rate of double, often treble, that figure.

Enthusiasm for hydrotherapy should not lead one to deprive the patient of sufficient rest, and except in cases of a temperature protracted in the neighborhood of 105° Fahr., it is best to omit at least one of the three hourly baths at night, and if desirable to give a mild hypnotic.

The Remarkable Endurance of the Japanese.

The Japanese are a small people, but their remarkable exploits in both war and peace have shown them to be possessed of a very unusual degree of endurance. In a recent article in the London Lancet it is stated that the Japanese themselves attribute their wonderful physical strength and endurance to their simple, non-flesh dietary. A number of exceedingly interesting statements are made, from which we quote the following:

"In 1899 a commission was appointed to consider whether by a meat diet or by other means the stature of the race could be raised; but the conclusion arrived at was that, seeing that their feats of strength and enduring powers were superior to races much taller than themselves, the lowness of their stature did not matter. Although during the period of their ascendancy the Samurai kept the secret that their *great physical superiority was due in a large measure to the internal and external use of water*, the belief that if used liberally and intelligently, water is an infallible weapon against disease, is now generally held. By those who go in for jiu-jitsu, an average of one gallon a day is drunk. . . . All that is really required by the people is that the water shall be pure. By the copious ingestion of water the action of the bowels and kidneys is stimulated, and it is noteworthy that rheumatism is almost unknown in Japan, it is probable that the absence of meat from the diet, combined with the use of plenty of water, accounts for this immunity. Bathing is indulged in frequently, even by the poorest. The water in the bath is heated to a temperature which would be impossible for an Englishman to endure—generally by a stove underneath the bath. These hot baths are taken to invigorate and harden, and a roll in the snow often follows the hottest bath. . . .

"The Japanese appreciate, above all things, the value of fresh air; night and day they keep their windows open and their rooms ventilated, and they do not fear drafts or damp air. Breathing exercises are an important part of their physical training—deep, careful breathing, which is acquired only by

practice. Nothing short of this perfection of health and strength, with its accompaniment of good mental balance and happiness, could have caused the Japanese to accomplish in thirty years what it has taken other nations centuries to achieve."—Modern Medicine, 1904.

PSYCHO-THERAPY.

EDITED BY LESLIE MEACHAM, M. D.

The Medical Record of October 1 abstracts from the August number of Archives de Neurologie an article by Legraine on the treatment of alcoholism by hypnotism in Russia. There are dispensaries where patients flock by hundreds, and hypnotism is the chief, if not the only treatment employed. The patients are required to desire sincerely to be cured, and to refrain from spirits while under treatment. This is a severe requirement, as in most cases their volition is almost abolished. They are subjected also to a continual surveillance. Nevertheless, hypnotism remains an extremely valuable and efficacious means in the cure of alcoholism. It gives good direction to the mental processes, and the necessary vigor to maintain the resolution not to drink. In order to avoid relapses it is necessary to enroll the alcoholics in societies of abstinence or temperance.

The New York Medical Journal of September 17 abstracts an article by Lissoff in the Roussky Vrach, giving the results of the treatment of one hundred drunkards—ninety-five men and five women, by hypnotic suggestion. Of this number twelve were not amenable to suggestion, sixty showed favorable results, i. e., cessation of drinking for a number of years as well as of craving for liquor. Twenty-four showed unfavorable results. In some of the cases not amenable to suggestion, confinement in an institution was found to be of value. He emphasizes the principle that it is not so much a method of treatment that is desired as a method of preventing this social disease, so generally regarded as a bad habit. Society conspires to make a drunkard out of the patient in spite of everything. He notes especially the fact that hypnotism was found to be of much more value in cases of habitual drunkards than in those that were given to periodical debauches.

(This is the usual experience in the treatment of alcoholics. The editor regrets that he never has seen a case of dipsomania, periodical drinking, that yielded to hypnotic suggestion. The steady drinkers, however, are easily cured as a rule.)

Sir Oliver Lodge, the distinguished electrical engineer and physicist, has recently delivered a series of lectures on "Physics Applied to Medicine." One was devoted to the relation of psychology to therapeutics, and has been abstracted in the September number of Medical Electrolgy and Radiology.

He regrets the insufficient attention given to the subject in England, and the tendency to receive anything new with suspicion and ridicule. He cites the ridicule that Lord Lister had to undergo when he first advocated antiseptic surgery. (We can parallel that on this side with the experience of Oliver Wendell Holmes in his plea for cleanliness in obstetrics.) The chief men in the profession to-day are too busy to attend to the investigation of new facts, but the young, who are to be the leaders of the next generation, are not too busy, and should keep an open mind in the direction of new discoveries, and not be deterred from examining into the evidence by merely conservative instincts. There is much doubtful or erroneous assertion, and it is necessary to cultivate an instinct for distinguishing the valuable from the refuse. So long as the main body of the profession hold aloof, new things are liable to be left in the hands of outsiders and half-educated persons, who, having caught a glimpse of the truth, are liable to be intoxicated by it and attach to it an unbalanced importance, not realizing its real place in the total scheme. It is the folly of uneducated advocates which destroys the early chances of so many new things. It is not wise to ignore these new things indiscriminately, but all reasonably urged and frequently repeated statements should be put to the test of experimental investigation, unrepressed by *a priori* conviction. Thus advance is retarded in these regions by an orthodoxy which deters young men from risking unpopularity by an examination into unrecognized facts. The work gets into unsuitable hands, and the whole subject is left in a state of disrepute unless taken up and worked by foreigners.

The influence of suggestion, the operation of the unconscious mind on the body, is now beginning to be recognized even in England, and indeed, has long been used, whether consciously or unconsciously. The field of action of the unconscious mind is much larger than is generally supposed, and there is really something more than the influence due to mere suggestion. There can be a communicated or telepathic suggestion in addition to what is ordinarily meant by the word suggestion. There is not only the influence of the mind on the body, and the influence of the unconscious mind on the conscious mind, but likewise the influence of one mind on another. If the recent assertions about *N*-rays be true, and rays emanate not only from muscles in a state of activity, but also from brain cells during a process of thought, then it is just possible that a solid physical basis may be found for our somewhat vague conception of the telepathic process. If it can be shown there are actually rays emitted by brains in a state of activity, rays which can exert a visible influence upon a fluorescent screen, then the supposition that these rays are the material basis of telepathy becomes a real working hypothesis, and will be justified in receiving a large share of attention.

SOCIETY MEETINGS.

FOURTEENTH ANNUAL MEETING OF THE AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION, HELD AT ST. LOUIS, MO., SEPTEMBER 13TH AND 14TH INCLUSIVE, 1904.

WEDNESDAY, SEPTEMBER 14, 1904, 9 O'CLOCK, A. M.

President in chair.

Dr. Willis Parsons Spring, Vice-President, called to the chair.

Address of President.

Dr. Spring: The President has so admirably covered the subject of the present state of progress, that I feel that a vote of thanks would be in order, and will entertain such a motion.

Dr. Morris Weil Brinkman, New York: I move that we not only thank the President for this address, but that we thank him for having so sufficiently and efficiently pointed out to us so much that has never been pointed out before, and which is of prime importance to us in our work, if we are to progress.

Motion carried.

Executive Session.

Reading of the minutes of last meeting dispensed with.

Report of the Executive Council read and received.

The names of the applicants for membership were read by the Secretary.

Dr. Spring made a motion that all the gentlemen whose names had been read be elected to Fellowship unanimously, and that the Secretary be instructed to cast the ballot.

Seconded by Dr. Snow.

Motion carried, and the Secretary cast the ballot.

Dr. Snow was appointed a committee to invite into the meeting, the newly elected Fellows, who were in waiting.

Fellows elected:

Drs. George H. Stover, Denver, Colo.; Eustathius Chancellor, St. Louis, Mo.; Otto Juettner, Cincinnati, Ohio; C. W. Strobell, Rutland, Vt.; Charles H. Hughes, St. Louis, Mo.; Bernard Wolff, Atlanta, Ga.; J. C. M. Floyd, Steubenville, Ohio; John Gillett, Sparta, Mich.; C. C. Morris, St. Louis, Mo.; Leslie Meacham, New York; John Rodman, Owensboro, N. Y.; J. A. Riviere, Paris, France; Henri L. Ducrocq, Lafourche Crossing, La.; Calvin O. Sones, Panora, Iowa; David O'Shea, Chicago, Ill.; E. P. Clark, Wyandott, Kan.; I. G. Babcock, Cumberland, Wis.; C. F. Winton, Cincinnati, Ohio; Ernest H. Spooner, St. Louis, Mo.; John W. Ellenberger, Harrisburg, Pa.; George D. Bond, Hillsboro, Tex.; John Trout-

man, Kansas City, Kan.; W. L. Brosius, Gallatin, Mo.; George M. Covert, Arkansas City, Kan.; Erasmus T. Camp, Gadsden, Ala.; William S. Lindsay, Topeka, Kan.; Gustavus Werber, Washington, D.; Charles W. Fassett, St. Joseph, Mo.; G. Lenox Curtis, New York; Albert M. Cole, Indianapolis, Ind.; George A. Stickney, Beverley, Mass.; Carlos M. Desvernine, Havana, Cuba; M. L. Bershinger, York, Pa.; T. L. Barber, Charlestown, W. Va.; Edward C. Titus, New York; Frederick F. Strong, Boston, Mass.; L. H. Quackenbush, Binghamton, N. Y.; Frederic de Kraft, New York; Henry Finkelpearl, Pittsburg, Pa.; Henry W. Barnum, Poughkeepsie, N. Y.; J. W. Torbett, Marlin, Tex.; Charles Denison, Denver, Colo.; R. Douglas Dobie, London, Eng.; Leopold D. Weiss, New York; Howard K. Swain, Philadelphia; M. Louis Weil, New York.

The Secretary read a communication from the American Roentgen Ray Society.

The Secretary read a letter from Dr. William Stevens.

The Secretary read a letter from Dr. William James Herdman.

The Secretary read a letter from Dr. Francis Besant Bishop.

The Secretary read a letter from the Anheuser-Busch Brewing Association.

Nominating Committee, consisting of the following named members was elected: Dr. Russell Herbert Boggs, Pittsburg, Pa.; Dr. Amedée Granger, New Orleans, La.; Dr. William Benham Snow, New York City.

The report of the Committee on Affiliation with the American Medical Association was presented by Dr. Clarence Edward Skinner, as follows:

"The special committee elected by the Association to consider the subject of affiliation with the American Medical Association placed itself in communication with the officers of that Association promptly, and after six or eight weeks a letter was received from an officer of the American Medical Association, stating that they were not prepared to consider the subject at that time. Since the receipt of that letter, your committee has received no further communications from them."

Dr. Spring made a motion that the question of amalgamation of the American Electro-Therapeutic Association with the American Medical Association be indefinitely dropped.

Dr. Dickson seconded the motion, which was carried.

Dr. Massey: I move that this Association instruct its Secretary to communicate with the officers of the American Medical Association, and request them to form a section on Physical Therapeutics.

Motion carried.

The Secretary stated in reference to the election of Drs.

Waite and Livingston, that these names were duly considered by the Executive Council, were recommended for membership, and were elected to membership. As they had been duly elected to membership, the motion on which they were elected was not subject to reconsideration, and a parliamentary mistake had been made in attempting to take that action, and that as a matter of fact, they were members, and are members, and that the only means by which their names could be removed would be by preferring charges.

Dr. Snow: I move that this question be laid on the table.

Motion carried.

Dr. Skinner: Inasmuch as these men were elected to membership, and according to Robert's Rules of Order, that motion could not be reconsidered, I move that the candidates be admitted to membership in this meeting, pending action which is to be taken at the next meeting.

Seconded by Dr. Roberts.

Dr. Dickson: I offer the following as an amendment, that the privileges of the floor be extended to Drs. Waite and Livingston.

Dr. Skinner: I accept the amendment.

Motion, as amended, put before the house and adopted.

The Secretary: I have received during the year a number of requests from libraries and individuals, asking for copies of our transactions. We have none. Therefore, I am unable to gratify these requests, and I would like to make a motion that the Editor of *ADVANCED THERAPEUTICS* be requested to furnish us 50 or 75 copies of the transactions of this Association, same to be published and given to this Society for distribution. I think we ought to have a few copies of these transactions, and I think that if these transactions are worth anything to *ADVANCED THERAPEUTICS*, and I think they are, they ought to be worth a few copies.

Dr. Massey: I second the motion.

Dr. Snow: I cannot do that, on account of financial considerations. We are furnishing your members a very good journal at a greatly reduced price. It seems to me that this is a matter of business and ought to be arranged for by the publishers, and the Executive Council. I think we ought to have the transactions published, but to come to the publisher with a demand that he furnish these free, without giving him any consideration, does not seem to me to be just.

Dr. Skinner: It was not meant to say that this should be done, but that it ought to be done.

Dr. Snow: We could preserve files of the journal for our transactions, or, what is better, after the journal is published, the plates could be retained, and the transactions could be published separately from these plates, and the cost would be nominal.

Dr. Massey: I wish to offer an amendment to this motion, that the Secretary be requested to inform all members, additionally to all other means of information, that all copies of the papers read here are the property of the Association, and are to be published primarily in the transactions first, and not to be published elsewhere until after that.

Dr. Skinner: I accept the amendment.

Dr. Spring: I think there is another side that we have overlooked. The transactions are a valuable set of papers, and I believe there would be a sale for them, and that to have a supply printed would be a good investment.

Dr. Snow: I move that this question be laid on the table until next meeting.

Motion to lay on table carried.

Scientific Session.

Dr. Daniel Roberts Brower, Chicago, Ill., read a paper on "Some Observations on the Medical Uses of the Constant Current."

Dr. George Coffin Johnston, Pittsburg, Pa., read a paper entitled, "Three Cases of Inoperable and Recurrent Sarcoma Successfully Treated by the Roentgen Ray." Discussed by Drs. Morton, Boggs, Dickson, and Grad.

The following names were announced as being the names of the gentlemen composing the Auditing Committee: Dr. Thomas Davidson Crothers, Hartford, Conn.; Dr. Henry Cook, Detroit.

BOOK REVIEWS.

LIGHT ENERGY; ITS PHYSICS, PHYSIOLOGICAL ACTION, AND THERAPEUTIC APPLICATIONS. By MARGARET A. CLEAVES, M. D., Fellow of the New York Academy of Medicine; Fellow of the American Electro-Therapeutic Association; Member of the New York County Medical Society; Fellow of the Société Française d'Électrothérapie; Fellow of the Electro-Chemical Society; Professor of Light Energy in the New York School of Physical Therapeutics; Late instructor in Electro-Therapeutics at the New York Post-Graduate Medical School. Published by Rebman Co., 10, West 23d Street, New York. Price \$5.00 in cloth; leather \$6.00.

This valuable volume is devoted in the first place to a careful consideration of the physics and manifestations of radiant energy in all its forms, including the well-known rays of the solar spectrum, the cathode rays, alpha, beta, gamma, and N-rays. The student of this subject will find here a text-book which will make clear the different aspects of the subject. Careful, scientific attention has been given to the physiological actions of light upon the various forms of life, vegetable organisms, and bacteria, with special consideration to the action

upon the skin, circulation, nervous system, and general metabolism.

The treatment of the subject of sun baths, in solaria, and of electric arc baths with reference to their effects upon various diseases, will be found of practical value to the profession. The local uses of light energy in the treatment of various skin diseases and other inflammatory conditions are treated in a practical and scientific manner. The uses of incandescent light baths in the treatment of rheumatic joints, chronic synovitis, and similar conditions, and in gynecology, are treated from the practical experience of the writer.

In treating of the vacuum-tube discharges, the writer gives the theory of action, and their practical application to therapeutics. The consideration of the *N*-rays in the light of recent investigations is carefully treated. Attention is also given to radium, and other radio-active substances with a consideration of their physiological action and therapeutic uses.

Fluorescent stimulation and sensitization and their therapeutic uses in the treatment of cancer, lupus vulgaris, and other conditions also receive consideration from the writer.

The writer has given a careful résumé of the subject and of the various apparatus in use in therapeutics from a practical experience. The work is written in the author's attractive style, and contains just what the student wishes to know. It is undoubtedly the best compilation upon this subject to the present time, and is an invaluable contribution to medical literature.

The publishers are also to be congratulated upon the attractive manner in which they have prepared the work.

DISEASES OF THE STOMACH AND INTESTINES: With an account of their relations to other diseases and of the most recent methods applicable to diagnosis and treatment of them in general; also "The Gastro-Intestinal Clinic," in which all such diseases are separately considered. By BOARDMAN REED, M. D., Professor of Diseases of the Gastro-Intestinal Tract, Hygiene, and Climatology in the Department of Medicine of Temple College, Philadelphia; Attending Physician to the Samaritan Hospital; Member of the American Medical Association; American Climatological Association; American Academy of Medicine; American Electro-Therapeutic Association; Foreign Member of the French Société D'Électrothérapie, etc. Published by E. B. Treat & Co., 241-243 West 23d Street, New York. Price, cloth, \$5.00; half morocco, \$6.00.

This work fills a present demand for a work upon one of the most important medical subjects. The author from a large experience has placed before the reader the practical modern

methods of managing a class of diseases upon which more probably depends than in the treatment of any other region of the body. The work covers the anatomical consideration of the Organs of the Digestive Tract, with a carefully written chapter upon the Physiology of Digestion, Absorption, and Defecation. Careful consideration is given to the Methods of Examination and of notable value are the author's own Methods of Outlining the Stomach and Viscera.

Much attention has been given to the chemical analysis of stomach contents and the fæces—an important part of systematic diagnosis, methods which have proved so valuable in the recent development of the subject. In the consideration of remedial measures, the writer has not failed to recognize the importance of the employment of physical therapeutics, exercise, massage, rest treatment, electricity in all forms, and the uses of lavage, enemata, counter-irritants, and mechanical vibration. The author considers the various diseases carefully, treating of all the important points of diagnosis and treatment, as only one who has had a large practical experience could present the subject.

The writer's style is clear and concise, and expresses the important features of each subject treated. The work is well illustrated and published in a substantial and attractive manner. The author and publishers are to be congratulated upon their work, and the profession upon the opportunity to procure such a practical treatise.

A PRACTICAL TREATISE ON DISEASES OF THE SKIN, for the use of Students and Practitioners. By JAMES NEVINS HYDE, A. M., M. D., Professor of Skin, Genito-Urinary, and Venereal Diseases, Rush Medical College, Chicago; Dermatologist to the Presbyterian, Augustana, and Michael Reese Hospitals of Chicago, and Consulting Dermatologist to the Chicago Hospital for Women and Children; and FRANK HIGH MONTGOMERY, M. D., Associate Professor of Skin, Genito-Urinary, and Venereal Diseases, Rush Medical College, Chicago; Professor of Skin and Venereal Diseases, Chicago Clinical School; Attending Physician for Skin and Venereal Diseases, St. Elizabeth Hospital, Chicago. Published by Lea Bros., Philadelphia and New York. Price \$4.50 cloth; \$5.50 leather.

This volume treats the subject of dermatology in a very complete and practical manner. The authors in this, the 7th edition of their work, have added many new topics which have not appeared in the previous volumes, notably a consideration of the General Pathology of the Skin, the Employment of Radiotherapy and Phototherapy and the consideration of vari-

ous skin diseases, which careful differentiation have developed. Special attention is called to what the author is pleased to consider Important Subjects of Technique and Value in Disease of the Skin—the Finsen light and the X-rays. They call special attention to the value of these modalities in the Treatment of Cutaneous Carcinoma, Tuberculosis, Acne, Rosacea, Psoriasis, and Lupus Erythematosus; many other chapters have been entirely rewritten.

The author's method of classification and diagnosis is thorough and is certain to be appreciated by the reader. The chapters on general Etiology, Pathology, Diagnosis, Prognosis, and Therapeutics are a valuable introduction to the work, outlining as they do, the general consideration of the subject. The diseases are arranged under eight distinct classes: Disorders of the Glands, Inflammations, Hypertrophies, Hemorrhages, Atrophies, New Growths, Sensory Dermato-Neuroses, and Parasitic Affections, each of which class is treated with a thoroughness which seems to be characteristic of the writer. The work is well illustrated, containing upwards of 100 illustrations, besides 34 fine plates in colors and half-tones. While the writer has not recognized some of the important methods now in common use, in the treatment of skin diseases, notably, the high-frequency currents, he has not failed to give practical methods of treatment, generally covering the requirements of most conditions. The work is one of the most valuable contributions to the literature of the subject that has been recently published.

The publisher is to be complimented on the excellent character of the color plates and half-tones, and the general execution of the work.

THE MEDICAL AND SURGICAL USES OF ELECTRICITY, including the X-ray, Finsen Light, Vibratory Therapeutics, and High-Frequency Currents. By A. D. ROCKWELL, A. M., M. D., Formerly Professor of Electro-Therapeutics in the New York Post-Graduate Medical School and Hospital; Fellow of the New York Academy of Medicine; Member of the American Academy of Medicine; Member of the New York Neurological Society; Formerly Electro-Therapist to the Woman's Hospital in the State of New York, etc. Published by E. B. Treat & Co., New York. Price \$5.00 net.

The writer of this work, who, together with Dr. Beard, issued the first edition of a work on Electro-Therapeutics, many years ago, from a very large and ripe experience, contributes this volume, which is the second edition of the work

that was rewritten by him from the earlier work in 1896. Six chapters have been added to the previous work, and attention has been given to the subject of the X-ray, Diagnosis in Therapeutics, and High-Frequency Currents. Several of the chapters have been entirely rewritten, and numerous alterations and additions made throughout. The writer calls attention to the fact that "the electrical currents are not only local stimulants, but also exercise an influence over the general as well as local nutrition which is unrivaled, entitling it to the highest rank among constitutional tonics." The subject treats in addition, Sections devoted to Electro-physics, Electro-physiology, and Electro-therapeutics, Electro-Surgery, and Roentgen Ray Work, Finsen Light, Vibratory Therapeutics, and High-frequency Currents. The book is written in the author's characteristic clear and concise style, and is devoted in the main to the uses of the older currents of Galvani and Faraday. The other subjects, however, of electro-therapeutics are not neglected. Under Electro-therapeutics, the writer considers first General Therapeutic Actions and General Results in Regard to Electricity as a Therapeutic Agent, Dosage, Differential Indications, and the Principles of Electrical Diagnosis. Diseases are considered under the usual classifications, and with the characteristic care and conservatism of the writer.

The work contains upwards of 250 illustrations, is printed on excellent paper, and is a publication which should be in the hands of every physician who would be thoroughly posted on the progress, development and advanced status of electro-therapeutics.

NEW AND IMPROVED APPARATUS.

This department is devoted to publishing, with illustrations, drawings, and descriptions, new apparatus, electrodes, etc., for the benefit of those interested in the progressive improvements in armamentaria.

ROENTGEN AMMETER FOR X-RAY TUBES.

Recognizing the very large demand for an ammeter to place directly in a tube circuit to indicate the X-ray energy which is delivered, the Roentgen Manufacturing Co., of Philadelphia, has given considerable attention to the subject, and now places

on the market an instrument which will undoubtedly meet with much favor.

It consists of an ammeter, constructed on the D'Arsonval plan, modified so that it will withstand the high voltage of the secondary circuit of an induction coil or the still higher



Roentgen Ammeter.

potential of the static machine. The ammeter is designed to be placed in circuit between the X-ray tube and the terminals of a coil or static machine. The illustration shows the instrument mounted on a pillar which can be attached to any convenient table or to a wall bracket. The range of the ammeter is from zero to 10 milliamperes, each division representing 1-5 of a milliampere.

Up to the present time "it has been impossible to determine the most important part of the technique of X-ray treatment—namely, the quantity of X-rays. We have been able readily to measure the length of time of treatment, the distance of the source of the rays from the patient, and approximately the

kind of rays; but we have been able only to guess at the quantity of the rays by the appearance of the tube and 'by the way the coil is running.'

"Now it is possible for X-ray workers to establish a complete and strictly scientific method of standardization of dosage.

"It makes no difference whether the various workers have static machines or coils, or whether some of them have mercury jet, or electrolytic, or other kinds of interrupters, if each worker will record the distance of the anti-cathode of the tube from the part exposed, the time of exposure, the vacuum of the tube, and the number of milliamperes flowing in the tube, his results may be duplicated by any other worker.

"The importance of the above proposition should be realized by X-ray workers everywhere. That accuracy of the measurement of the relative quantities involved is possible should interest every expert.

"The ammeter indicates the direct current and not the 'inverse discharge' from the induction coil. That the inverse discharge must be kept out of the tube to prevent its blackening and the lowering of its vacuum is common knowledge among X-ray workers. If the inverse discharge begins to pass into the tube the meter needle will begin to retreat rapidly and will give a much lower reading as the volume of the coil discharge is increased. The meter gives this warning much more surely and is a better indication than the appearance of the fluorescent rings upon the walls of the tube, which heretofore have been our guide.

"Thus it is seen that the meter responds very quickly to any change in the conditions for the operation of the tube, and that its reading at any time indicates only the current which is producing X-rays."

Mr. James G. Biddle, 1114 Chestnut Street, Philadelphia, is general sales agent for the Roentgen Manufacturing Co.

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CLINICAL AND EXPERIMENTAL EFFECTS OF ELECTRICAL CURRENTS OF HIGH POTENTIAL AND FREQUENCY.*

BY JOHN H. BURCH, M. D., BALDWINVILLE, N. Y.

Member of the American Electro-Therapeutic Association, Syracuse Academy
of Medicine, Onondaga County Medical Society, etc.

A critical analysis of the current American literature upon high-frequency currents reveals a series of contributions for the most part contradictory in character, and, unfortunately, portraying, in many instances, a most profound ignorance of this form of electrical energy. Yet, a careful review of the therapeutic results purported to have been achieved by means of these various modalities, classed as high-frequency currents, discloses the facts that clinically the effects are about the same. This would lead one to conclude that either suggestion enters largely into the rôle of high-frequency therapy, or that this uniformity of effect is the result of potential, for in all of the modalities advocated the voltage has been exceedingly high.

One prominent worker in this field maintained that all high-frequency effects may clinically be produced by simply attaching a vacuum electrode to one of the prime conductors of a static machine, the other side being grounded. The electrode is applied either labile or stabile to the affected part. Clinically, the results achieved by this observer have been excellent, comparing favorably with the reports of the French and continental observers. This modality is simply an interrupted continuous current of extremely high voltage; while a high-frequency current proper must be alternating in character, the frequency of which depends upon the rapidity with which the current oscillates from zero to zero.

* Read at the Fourteenth Annual Meeting of the American Electro-Therapeutic Association at St. Louis, Sept. 14, 1904.

Another American observer maintains that the therapeutic effect of high-frequency currents depends almost wholly upon the rate of frequency that can be obtained. He further affirms that this rapid rate of frequency can only be produced by means of a step-up transformer, and a Tesla coil of his own peculiar construction. The potential of this apparatus is extremely high, as is also the frequency, and, unfortunately, the current output as well, the latter being such that sparks can only be borne by causing them to pass through a thick plate of glass before bombarding the area to be treated. In using this form of apparatus applications are made either stable or labile to the affected part, together with the brush discharge. The clinical results achieved by this worker and those using this form of apparatus are practically the same as those reported from the use of the D'Arsonval solenoid, the Oudin resonator, and the static machine.

The results, as far as I can learn, in all the above modalities, are based upon clinical experience, there having been no published report of accurate scientific research in regard to the physical and physiological properties of these various modalities. Of course, we must all admit that the therapeutic efficacy of a remedy in many instances would seem to be entirely opposed to its physiological action. Yet, to place these various modalities upon a rational basis we must have a definite conception of their physical properties and physiological effects.

The foreign literature upon this subject is much more uniform, and the clinical deductions apparently much more exact. While Morton was the first to demonstrate high frequency currents as applied to medicine, it remained for D'Arsonval to critically study this form of electrical energy.

After carefully studying the physical properties of these currents he decided upon resonance as the safest and, at the same time, most reliable method of employing these modalities. By means of two small Leyden jars he found that condensation could be accurately attuned not only to the inductance of the secondary of the coil that supplied the source of energy, but also to the self-inductance of the small solenoid, thereby giving birth in the latter to each alternating pulsation that took place within the condensers. By means of this simple apparatus he obtained a rate of frequency and voltage sufficient for all practical purposes. He next began a series of experimental

research on the physiological effects of alternating currents of high potential and frequency that stand unique in this field of investigation. Oudin still further increased the efficacy of the small solenoid of D'Arsonval by simply extending the spiral of the latter by adding it to a helix of smaller wire. By a perfect attunement of the condensence with the self-inductance of the first few strands of the small solenoid, oscillations are carried along the strands of the upper spiral, each of which is amplified by means of resonance, until thousands of volts are produced at the terminal, each oscillation synchronizing with the oscillations of the Leyden jars. The recoil kick may be still further augmented, thereby increasing the spark length at the terminal of the resonator by simply grounding the lower strand of the small solenoid.

It was by means of the small solenoid that D'Arsonval studied the effects of these rapidly alternating currents upon respiration and combustion, and by the Oudin modification that Tripet and Apostoli so thoroughly demonstrated their effect upon the blood. Charrin made urinary examinations and determined their effects upon metabolism, while Oudin, Leduc, Areinzo, Fabrozze, and Freund so thoroughly demonstrated their effect upon the skin.

From this thorough preliminary work clinical deductions and confirmations were rapidly forthcoming, and the use and limitations of these forms of electrical energy were fairly well established. In America the conditions are unfortunately different. Here clinical investigation takes the place of more accurate scientific research, and physiological effects are presumed from clinical analogy rather than proved. The partisans of the static machine maintain that the effects of this current differ from the coil, and the users of the Tesla apparatus claim a vast difference in the physical and physiological action of this form of energy. Yet therapeutically, the results of all seem to be about the same.

Perhaps no worker has done more to place medical electrology upon its proper basis than Freund. He conducted a series of the most accurate and painstaking experiments that seem to demonstrate that the essential element of these various modalities is potential, and that the greater the current capacity that can be reasonably borne in connection with these high tensions the more pronounced will be the physiological

effect. His experimental research clearly proves that the apparatus employed bears relation to the effects of these various modalities only in their capacities to produce sufficient voltage and amperage.

Having used these various modalities for the past two years, and feeling myself wholly at sea in regard to their physical and physiological effects, I decided, I fear, in a very crude manner, to satisfy myself in regard to the essential difference, if any, of these various modalities. I first decided to compare the effects of currents generated from these various forms of apparatus upon photographic plates. Second, their chemical action upon paper saturated with a solution of potassium iodide. Third, their effects upon micro-organisms, and fourth, the effects of quiet discharges upon blood pressure, nutrition, and metabolism.

The Effect of Spark Discharges Upon Photographic Plates.

(1) A piece of Eastman's film 4x5 c wrapped in a black paper envelope that is likewise wrapped in an orange paper. The film thus protected is placed within a Petri dish over which the cover is placed, and around the circumference of which a metal band is fastened to minimize the tendency of

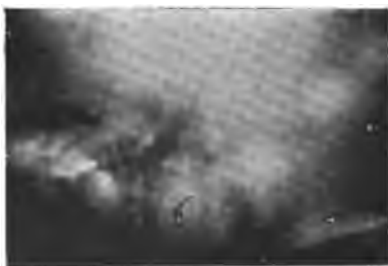


Fig. 1. — Spark discharge from resonator attached to coil. Spark length 5c. Duration 30 seconds.



Fig. 2. — Indirect positive spark discharge. Static machine.

the inner surface of the dish to become electrically charged. The Petri dish thus arranged is placed upon a metal plate that is connected with the lower spiral of an Oudin resonator. The upper terminal of the resonator is connected to a brass point electrode. The source of primary energy is a small generator driven by a water motor. Coil eight inch, mechanical inter-

rupter. Current employed for this experiment thirty volts, four amperes. Sparks from the above electrode were allowed to fall for thirty seconds upon the upper cover of the Petri dish. Film developed with metol-hydrochonone. Result of experiment shown in photograph.

(2) Same arrangement as above, except that the metal plate is placed upon the insulated platform, and connected with the negative side of the static machine; ten revolving plates, thirty inches in diameter, running at a high speed. Ball electrode grounded, as is also the positive side of the machine. Sparks are allowed to fall upon the cover of the Petri dish for thirty seconds. The behavior of the spark is different from



Fig. 3.—Indirect negative spark.
Static machine.



Fig. 4.—Spark discharge from positive side of static machine.

that of the resonator. It does not seem to penetrate the glass, but flows over its surface to the metal collar that is in contact with the metal plate upon which the dish rests. Upon development of the film the result is negative.

(3) Same as No. 2, except that the plate is connected to the negative side of the static machine, the positive being grounded. Upon developing the plate the results were the same as in experiment No. 2, entirely negative.

(4) Petri dish and film arranged as before, being placed upon the same metal plate, that is now connected with the chain that grounds the negative side of a ten-plate Holt's static machine. To the positive side of the machine is connected a flexible cord to the extremity of which is attached a brass ball electrode. Sparks are allowed to fall upon the cover of the Petri dish as before for thirty seconds. Upon development the results are the same as in experiments two and three. Re-

versing the grounding and electrode the results are also negative.

(5) Same arrangement except that the plate is connected to one of the terminals of a Kinraide coil, and to the other is attached the point electrode. Sparks fall as before for thirty seconds. Results of experiment shown in photograph No. 6.

(6) Plate is connected to the lower spiral of an Oudin resonator. The resonator is excited by means of a ten-plate machine, run at the rate of 450 r. m. The upper terminal of the resonator being connected to the brass point electrode. Sparks



Fig. 5.—Direct static spark.

are applied to the Petri dish for thirty seconds. Result, positive photograph No. 8.

(7) Resonator again connected with the coil, the conditions being the same as in experiment No. 1, except that a glass vacuum electrode is used in place of the brass point. Result, photograph No. 7.

Employing the same Petri dish as in the other experiments, a piece of blotting paper moistened with a saturated solution of potassium iodide is placed within the dish, which likewise is placed within a leather mitten. The mitten is placed upon a metal plate that is connected with the lower strand of an Oudin resonator. The upper strand of the resonator is attached to a vacuum glass electrode. The resonator is excited by means of an eight-inch coil, mechanical interrupter, source of energy being a small dynamo fifty volts eight amperes, driven by means of a small water motor. Sparks are allowed to fall upon the mitten for fifteen seconds. Upon examining the blotting paper it was found to be thoroughly blackened on both sides. The same experiment is repeated, using as a source of energy a Kinraide coil. The paper in this experiment

is blackened in patches, and only on one side. It is again repeated with the same resonator excited by means of a ten (revolving) plate static machine, the result being a diffuse blackening of but one side of the paper upon which the sparks

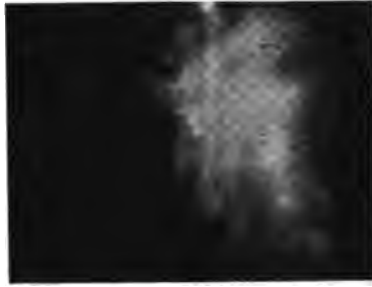


Fig. 6.—Spark discharge from a Kinraide coil.

were allowed to fall. The mitten containing the Petri dish and blotting paper was then placed upon the insulated platform of the static machine, resting upon a metal plate that was attached to the positive side of the machine. Sparks from the grounded negative electrode were allowed to fall upon the mitten as before for fifteen seconds. There was no coloration of the paper. Repeating the experiment by reversing the connections gave a like result. The experiment was then repeated



Fig. 7.—Resonator attached to static machine. Vacuum electrode.
5 seconds.

without the platform, attaching the plate to first one and then the other side of the machine, and connecting the brass ball electrode to the other. The results were somewhat more appreciable than the above, as the paper was colored in small

areas. The side of the machine employed seemed to make but little difference.

The next series of experiments consisted in wrapping a very sensitive photographic plate in a black paper container. The hand was placed upon this plate, and sparks from the upper terminal of the resonator were allowed to fall upon the hand, as powerful as could be borne for thirty seconds. This experiment was repeated by employing all of the before mentioned modalities. Upon developing the plates the results were negative in each experiment, the silver salts were not affected. Sparks applied to the hand of a cadaver under exactly the same conditions brought forth the same negative results. The experiments were likewise repeated by applying a vacuum electrode directly to the hand, using in turn each of the above modalities. The results were negative in each instance. Small pieces of film were also inclosed in black and yellow paper. These films thus inclosed were held in the mouth, while sparks were applied to the cheek as strong as could be borne, the source of energy being the resonator attached to the coil. Results, negative. Repeated with resonator attached to static machine gave likewise negative results.

A Loeffler serum tube was inoculated with the exudate from a patient suffering from what proved to be a streptococcous infection. The organism was of a very virulent type, and after being further isolated by means of a plate culture, a bullion tube was inoculated, and placed in the incubator for twenty-four hours. From this culture agar tubes were inoculated at a temperature of 40° C., and immediately poured into six sterile Petri dishes. These infected plates were numbered and divided into pairs. One of each pair was to be used as a control test, while the other was to be utilized in the experiment. The first experiment consisted in placing an infected Petri dish upon the metal plate in the manner utilized in the other experiments, and allowing sparks to fall upon the upper surface of the dish for one minute. The source of energy in this experiment was an Oudin resonator, excited by an eight-inch coil, the primary current being forty volts and eight amperes. After remaining twenty-four hours in the incubator this plate and its control were examined. The control plate presented a large number of colonies, while the plate subjected to the sparks presented no colonies whatsoever over the area

bombarded by the sparks. Another plate was subjected to a quiet discharge from a vacuum electrode applied directly to the surface of the Petri dish. In this experiment the discharge was not altogether quiet, as sparks could be seen passing through the cover of the dish. This discharge was allowed to pass for two minutes. After incubating twenty-four hours the control plate was richly studded with cultures; while the plate subjected to the discharge presented colonies throughout its area, they were not quite as numerous as in the control test. The resonator was next attached to the static machine. That contained ten revolving plates, run at a speed of 400 revolutions per minute. Sparks from a brass-point electrode were allowed to fall, as in the first experiment, on the cover of the dish for one minute. In this experiment, as in others above mentioned, the sparks seemed to spread over the surface of the dish rather than penetrating it. At the expiration of twenty-four hours both the control and the test culture were studded with colonies, although the test plate contained much less than the control.

Infected plates were likewise subjected to sparks direct from one side of the static machine, the other being grounded with no appreciable effect upon the growth of the organisms.

This series of experiments would seem to indicate that high-frequency currents, stepped-up from the secondary of a coil, possess much more penetrative power, more actinic properties, and greater germicidal effects than those derived from a static machine. Also, that a high-frequency apparatus actuated by a static machine has greater penetration, actinic and germicidal properties than the current from the machine itself. The very careful experiments of Freund, on the other hand, clearly demonstrate that the discharge direct from the secondary of the coil itself possesses these properties to a much greater extent than the modified spark from the high-frequency transformer, and further, that the greater the length and fatness of the spark the more pronounced will be these penetrative, actinic, and germicidal properties. From this it would seem justifiable to infer that amperage, as well as potential, is essential, and that the spark is much more potent than the quiet discharge.

(To be continued)

SENSITIZATION OF LIVING TISSUES.

BY MARGARET A. CLEAVES, M. D.

(Continued from page 671.)

Dreyer formulates the following conclusions in regard to sensitization:

(1) The fluorescence is not the determining factor in sensitization, because there are substances which are strongly fluorescent, which, however, are only slightly sensitizing, or not at all so (esculin, fluorescin), and on the other hand, there are non-fluorescent substances which are capable of sensitizing (cyanin).

(2) Neither is the absorption the determining property, because there are fluorescent as well as non-fluorescent substances which are very absorbent, which are, however, not sensitizing to the rays which they absorb.

(3) It is scarcely probable that the sensitizing depends upon the formation of toxic products in the sensitizer during the exposure, which have a deleterious effect upon the micro-organisms and the animal tissues, because if a sensitizer, as, for instance, erythrosin, is first exposed to light for ten minutes and thereafter immediately used as a sensitizer, its power in this direction will be greatly diminished. This is very clearly demonstrated by the following table:

Filter.	Time required to kill <i>Nassula</i> sensitized with	
	Erythrosin sol. (1:8000) not exposed to light.	Erythrosin sol. (1:8000) exposed to light.
Rock crystal.....	12 seconds	18 seconds
Clear glass.....	12 "	25 "
5% nickel sulphate.....	12 "	30 "
Blue glass.....	36 "	135 "
5% potassium chromate.....	12 "	30 "
5% potass. bichromate.....	12 "	70 "

It cannot be regarded simply as a coincidence that almost all the coloring substances which in the experiments referred to were found to be active were more or less fluorescent. It must be understood, therefore, from the first two points formulated by Dreyer, that neither the fluorescence nor the absorption alone is the determining factor. Both are evidently of importance. If the frequencies of oscillating light energy

of the yellow and green regions of the spectrum were not absorbed they could not exert any deadly influence; or, in other words, they could not do any work. As it is the presence of the chlorophyll which facilitates the absorption of the energy, governing plant assimilation and disassimilation, so do these coloring substances facilitate the absorption of the strongly penetrating energy of the spectrum, determining thereby actual changes in the tissues. There are great numbers of photographic sensitizers which are non-fluorescent, nor does the fact that a coloring matter which possesses a profound sensitizing action on photographic silver haloids authorize, taking it for granted that it may comport itself in the same fashion with living tissue for a sensitizer without further proof. It does not follow even in photographic processes that the same substance shall in every instance act as a sensitizer. In one instance it may and another not, although the same substance often possesses both properties, besides there is a difference between optical and chemical sensitizers, just as there is between optical and chemical light intensity. It may be proven by further experimental work, whether in sensitizing living organisms, phenomena are not produced which though leading to similar results may be of an altogether different nature.

Tappeiner* extended his experiments with regard to sensitization into other provinces than those above mentioned. He showed that enzymes (papayotin, diastase, invertin) as well as toxins (rizan) were weakened by exposure to light after the addition of certain fluorescent substances—as eosin or magdala red—while no noticeable change took place, if after the addition of the same substances they were kept in the dark.

The above-mentioned artistic sensitization is not only of great theoretical interest, but also has prospect of attaining an extensive practical importance, among other things, with regard to the therapy of light energy. Already in 1900 Tappeiner concluded his recital of the above-mentioned experiments with the following statement: "Conversely, by the incorporation or extraction of certain fluorescent substances, it may be possible, through the action of light, to obtain a thera-

* *Berichte d. d. chem. Gesselschaft* 1903, Bd. XXXVI., S. 3035, and quoted by Busck.

These experiments of Tappeiner were made the subject of a study by G. Busck,* who points out that the discovery of these phenomena happened during the same experiments with the toxicity of various preparations derived from quinin, and that the quinin preparations possess such sensitizing (sensitiveness-arousing) qualities.

The fact that frequencies otherwise fairly inactive proved themselves strongly microbicidal with regard to sensitized micro-organisms, led him to look for the power of these preparations to make the plasmodiæ sensitive, so that the latter are destroyed or weakened under the influence of daylight.

According to some investigations, now more than thirty years old, by Jones, Rhoads and Pepper,† the blood and most of the tissues in human beings and animals are slightly fluorescent; in malarial patients this fluorescence is considerably reduced, while it again increases by the taking of quinin.

It is known in this disease that the blood loses its fluorescent property, and that the remedy for it is to be found in a substance which, under exposure to ultra-violet light or the higher of the visible chemical frequencies of the spectrum, absorbs the higher energy of radiation, and emits it at the lower, but still within the chemical frequencies of the spectrum. This is shown by the characteristic coloring, blue, of a solution of quinin sulphate when exposed to the chemical frequencies of light.

Quinin and several of its derivatives have been shown to have sensitizing properties as well as the phenomena of fluorescence. These cinchona preparations exert a specific action on malaria, an action which can scarcely be explained on the ground of its toxic effect on the malarial plasmodium alone, although, according to the investigations made into its nature and mode of action, this is evidently of great importance. The question is asked by Busck, who has given the latter some considerable attention, whether it is not probable that the sensitizing properties of the quinin preparations bear a relation to the therapeutic effect. In the fact that the "specific" action of quinin is not understood, he finds a reason for not leaving any of these peculiarities of condition out of consideration, and at least so

* Mitteilungen aus Finsen's Medicinische Licht Institut, 1904, Heft VIII.

† Pennsylvania Hospital Reports for 1898, pp. 269-280; also Philadelphia Medical Times, Jan. 23, 1879, p. 259, etc.

well a marked one as their sensitizing power when seeking for an explanation.

Busck suggests that an inquiry as to whether daylight does not contribute at least somewhat to the successful results of the quinin treatment by killing, or at least weakening, the sensitized malarial plasmodium would be in order.

He bases his views, which are also entertained by others, upon the following facts:

(1) Quinin is fluorescent even in extreme dilutions, 1—1,000,000, and its sensitizing power is demonstrated among others by Ullmann's experiments, which show that paramoecia placed in a quinin solution 1-20000 did not die until after five hours when standing in the dark, while they were already killed inside of eight minutes when he placed them in the sunlight under conditions which otherwise could not have exerted any harmful influence on paramoecia.

(2) According to Jacobson's and Dreyer's experiments light is able to exert its bactericidal action on the sensitized organism, even after passing through a layer of animal tissue. The depth to which it is able to exert this action depends, of course, among other things on the intensity of the light.

(3) The tissue elements of the human body are pellucid, and even if only a comparatively small portion of the body surface is exposed to light, the blood, and with it also the plasmodia, on account of the constant circulation, may be exposed to the influence of the light.

Busck concludes that should these hypotheses be correct, which can be readily determined by clinical examination of patients treated with quinin in light and darkness, sun baths or electric light baths would seem to be indicated in connection with the quinin treatment of malarial patients. It is interesting to note in this connection that there appeared in the current medical literature of the day, several years since, the statement that an Italian physician administered quinin to his malarial patients and then exposed them to the action of blue light in a room in which the ordinary clear glass was replaced by blue glass. Upon reading the report the method was practiced by a physician living in Illinois upon his malarial patients, with what he felt was an unusual degree of success in the management of the same class of patients. The same medication, i. e., calomel and quinin, was exhibited as when

no such exposure to the visible chemical energy of the spectrum was made. According to this physician,* better and more prompt results were obtained than with the classic method.

Busck and Dr. Siim have undertaken a number of experiments which are not yet quite finished, but which, in view of the thoroughly careful and scientific work carried on at the Finsen Light Institute, at Copenhagen, cannot fail to be prolific in results for or against the theory.† As yet they have not yielded any positive results.

T. Cattaneo, who was much impressed by d'Abbadies' remarks upon the effects of sulphur mines on paludism and some observations published about the same time, on the immunity of earth eaters from miasmatic disease, conceived the possibility of combining the administration of the sulphates and fluorescent salts of quinin with exposure to light as a cure for malaria.‡

616 Madison Avenue,
New York City.

October 15, 1904.

* Personal communication—in changing his office the journal containing the original reference was lost, therefore the name of the Italian physician is not given, but the author surmises that it is the same as the one referred to in the concluding paragraph of this paper.

† The beneficent action of the Danish Government in endowing the light institute of Finsen at Copenhagen cannot be too heartily commended, and the author cannot but voice the hope that the Commonwealth of the paternal government or that of the States may see their way to a similar action.

The workers are ready, but amidst the perplexities and cares of the physician's daily life, with its never-ending problem of the wherewith, it is impossible to enter into the harvest which awaits the intelligent investigator.

‡ *Med. Electrology and Radiology*, April, 1904, Editorial.

SULPHURIC ACID AS A MEANS OF DRYING THE INTERIOR OF THE STATIC MACHINE.

BY R. DOUGLAS DOBIE, M. D., M. R. C. S., ENG., LONDON, ENG.

In the August number of the JOURNAL, I read with a good deal of interest, Dr. Coolidge's article on "Sulphuric Acid as a Drying Agent."

I fully agree with the doctor's expression of satisfaction anent the use of sulphuric acid in this capacity.

I have used it for some time now, with the most complete satisfaction, not only for its moisture absorbing properties, but it possesses another distinct advantage, which is, that on opening your case, there is but little odor, and none of an irritating nature.

I cannot agree with Dr. Coolidge, that the change in the color of the acid, from light to red, is either a sign of oxidation or an indication for renewing the acid. This reddish color is entirely due to the nitrous acid, which is formed and absorbed in certain quantities by the sulphuric acid. I have known the acid to become a cherry-red in twenty-four hours (this was when the case of the machine was opened for but a few seconds and fresh acid put in). But its hygroscopic powers were by no means diminished, in fact, a few days later, the hygrometer in my case had dropped another twenty degrees after the discoloration of the acid, and I continued to use it for some four weeks longer. I find that the only safe indicator for renewing the acid is the hygrometer, when this drops to fifty degrees. I know that it is time to open the case and put in fresh acid; when doing this, I make it a point to thoroughly air the case, and dry all the brass-work. When this is finished, I find that my hygrometer is generally pointing at eighty-five degrees; I then put in the fresh acid, using a glass tray 16x12 inches and by two inches deep, into which I pour about ten pounds of acid. I then practically seal up my machine, in as much that I cover all the joints with broad rubber plaster. The following morning (this being done at the end of the day's work), I expect and do find the hygrometer to be standing at somewhere between thirty-five and forty degrees, and in the course of two or three days it will go down as low as 25 degrees, then up to thirty degrees, where

it remains stationary for some fourteen days or so, and then begins to drop slowly.

I must crave pardon for taking up so much of your valuable space, but knowing that the readers of the JOURNAL are numerous and in different lands, it may be that some are situated like unto myself, in a consistently humid town.

The average humidity of the city of London is about eighty, and it is to these gentlemen who have to be constantly changing their drying agent that I would repeat Dr. C.'s advice: "try sulphuric acid, and you will not be disappointed."

To those who desire to absorb the ozone as well, I would suggest a similar tray of pure linseed oil, placed in the case, at the opposite end to the acid.

110 Strand W.



DIETETICS IN THE TREATMENT OF CONSTIPATION.*

BY SIGISMUND COHN, M. D., NEW YORK

In the treatment of constipation it is necessary to pay attention to a few points of importance. First, we have to be sure that we deal with a true case of habitual constipation. That is not always as easy as it looks. Hemorrhoids, fissures of the anus, hypertrophy of the prostate, tumors of the uterus or of the ovaries, retroflexion, antifixion, and other malpositions of the uterus, they all will give rise to constipation. Diseases of the intestines themselves, as stenosis, disease of the stomach, as hyperacidity, anacidity, they all will more or less cause constipation. Sometimes the causes may come from outside, for instance, from the nervous system, from disturbances of circulation, etc. Therefore, a very careful examination of the whole body is necessary, because only by exclusion of all these factors will we be able to make the diagnosis of a true atonic condition of the bowels.

Having settled this, the next point of importance will be to find the causes for this faulty condition of the bowels. Almost without exception you will find it to be due to hygienic and dietetic errors.

Almost everyone of our patients will confess to one or more habits which have finally destroyed the proper physiological function of the intestines. Hewes of Boston has made up a list of 1200 cases seen during the months of July, August, and September, 1902, in his clinic. Six hundred and ninety of them, or fifty-one per cent., give a history of habitual constipation. Of these cases 660, or ninety per cent., were using regularly a dose of medicine. Of the remaining ten per cent., a few had received some general directions as to diet and hygiene. You see that one of the greatest abuses is the abuse of drugs. While drugs may be useful for temporary conditions, the habitual use of them will destroy the proper function of the bowels. Another frequent cause for constipation is the neglect of the patient to attend to the calls of nature. For different reasons, mostly lack of opportunity or time, the

* Read before the Clinical Society of the New York School of Physical Therapeutics, Friday, October 21, 1904.

call of nature is disobeyed. This does not happen once, but is a daily occurrence. And what is the result? A toleration will be established on the part of the mucous membrane and the terminal nerve filament, and that which was regarded by nature as a foreign body to be expelled, at the proper time, is now permitted to remain to take up a permanent abode. Another pernicious habit is to read while at stool. People cannot understand that it is futile to do two things at one and the same time. How insufficient physical exercise will cause constipation I need hardly to explain. Exercise stimulates all physiological processes in the organism. Circulation, respiration, and innervation of nerves and muscles. Lack of sufficient exercise will naturally reverse all this. Circulation will become sluggish, respiration, and therefore oxygenation, will be retarded, and the physiological function of the muscles will also be weakened. You all know the depressing effect of mental worry and prolonged mental work, and we need not be surprised to find constipation in worrisome and overworked people. Another cause is muscular weakness of the abdominal walls with consequent enteroptosis. Still the most important causes are errors in diet.

To begin, with food as plain as water, we will find that patients suffering from constipation generally drink an insufficient amount of water. Normally the amount of water taken in twenty-four hours varies from two to four pints, or from four to eight glasses. The character of the solid food, the dryness and the temperature of the air, will make these variations. As the water is almost exclusively absorbed from the intestines, they will contribute there to softening of the fecal matter. The temperature of the drinking water is also an important factor. Cold water will stimulate and cause a more rapid and a more copious secretion of the digestive juices, therefore it is wrong, as so many people do, to drink warm water to promote the action of the bowels; they should rather drink cold water. Constipated people should make it a rule to drink between six and eight glasses of water a day.

Coming now to the solid food, you know that we take our foodstuffs partly from the animal and partly from the vegetable kingdoms. From the animal kingdom we get most of our proteids and fat, but the vegetable kingdom gives us most of our starchy food. Living on a mixed diet, our average

amount of food will be between 100 to 150 grams of proteids, mostly from the animal kingdom, and 90 to 100 grams of fat, also from the animal kingdom, while from the vegetable kingdom we take between 400 to 500 grams of starch. The proteids and fats, especially from the animal kingdom, are concentrated nutritive foodstuffs with very little residue, while the carbohydrates coming from the vegetable kingdom, are very rich in cellulose (the coarse vegetable fiber) which resists digestion, and gives therefore a large amount of residual matter. Therefore the bulk of our food is made up from the vegetables, but just this bulk is necessary for the natural stimulation of the physiological function of the bowels. Without this bulk, no matter how nutritious our food may be, no excitation of peristalsis can be effected. You see, what an important factor the residual matter, and therefore the vegetable diet, is for the function of the bowels. Professor Rubner, in Berlin, has found by experiment the residual matter of the different food products, and it is interesting to see the difference of residue from animal and vegetable food. The dried residue, for instance, from meat, fish, and egg, varies from 4.9 to 5.2. This residue is mostly made up of proteids, and contains no starch. The residue from the vegetable food, as rye bread, pumpernickel, beets, cabbage, turnips, beans, etc. was about 20, and contained a large percentage of starch. The importance of this residue starch lies in the fact that it will undergo fermentation, of which the end products will be certain organic acids: lactic acid, acetic acid, and carbon-dioxide. These organic acids will by their chemical irritation help in the excitation of peristalsis. There are certain foodstuffs which are especially rich in these organic acids, as tamarinds, prunes, plums, manna, and other fruits and vegetables. The question of white and rye bread is often mentioned in regard to the treatment of constipation. A look at the residue will teach us that white bread has 4.2 residue, while rye bread 20.9, and therefore there is no doubt that we will prefer rye bread to white bread in the treatment of constipation. Milk is generally considered as a very digestible food, but it has a residue of 8.8. I would like to mention here another experiment of Rubner; he treated a patient first with a diet made up entirely of animal food. The intestines didn't evacuate their contents before three to four days. Then he treated a patient with a vegetable diet

of corresponding nutritive value, and stool occurred in nineteen to twenty-four hours. These results thus gained by experiments we also find confirmed by our experience in practice. Constipation is mostly found among the better situated classes, who indulge in concentrated nutritious animal food, while it is comparatively rare among people who are not able to feed on a surplus of meat. So we find constipation among city people, but seldom among country people, because city people favor meat, and country people more the vegetables. One of the animal foodstuffs will, in a moderate way, also contribute to make the bowels move easier, that is the fat. As a rule, fat, if taken in normal quantity, will give little residue; if, however, taken in excess there may remain considerable residue, and this latter will act as a lubricant on the intestines.

Summing up, we may say, the treatment of habitual constipation has to begin with (1) the correction of bad habits, and (2) regulation of the diet. The object of the diet is to avoid concentrated animal food and to favor the vegetables rich enough in coarse fiber to make sufficient bulk for the physical stimulation of the intestines, and rich in elements for the formation of organic acids for the chemical stimulation of the intestines; (3) the liberal use of water, at least six to eight glasses in twenty-four hours shall not be forgotten.

If we follow these principles, it is not difficult at all to make up a diet for our patient. In very pronounced cases of faulty habit and diet, their correction may be sufficient. But in most cases we will have to select the foodstuff especially rich in bulk and organic acids. As rye bread, pumpernickel, beets, plums, fruits, etc.

As an example for such a diet, a breakfast may consist of fruit, some cereal with cream and sugar, but no commercial predigested foods, as grape nuts or force. Rye bread, with much butter, besides this, some meat or eggs. For dinner, besides soup, and meat or fish, plenty of green vegetables, as spinach or cabbage, beets, turnips, potatoes, beans, peas, and again rye bread and butter; as dessert, a saucer of prunes, but it may change off with some pudding. Supper should be rather light, and may consist of cold meat, rye bread and butter, and some stewed fruit, again prunes and plums preferred.

The success of such a treatment is very remarkable, and we see results in a few days even in cases of long standing. Of course, in such cases, I would prefer a combination of dietetic and physical therapeutics, especially electricity. This combination will give us most brilliant results, but I believe the dietetical treatment will have to remain the fundamental one without which we will hardly be successful.

VIBRATORY TREATMENT OF CONSTIPATION.*

BY ARNOLD SNOW, M. D., NEW YORK

Constipation is characterized by "an abnormal sluggishness and imperfect evacuation in the movement of the intestinal contents through their canal," which may be due to (1) atonic conditions; (2) obstructive causes; (3) habit; (4) various diseases of the spinal cord; (5) a pulling down of the recto-vaginal septum; (6) anomalies, as congenital dilatation of the colon, or congenital strictures; (7) lead poisoning; (8) hernia; (9) peritonitis; (10) displacement of the right kidney, obstructing the lumen of the duodenum; (11) spasm of the pylorus, or the muscles of the intestine, as in hysteria and neurasthenia.

Some have a daily movement; others have a passage every two days or so, and there are cases on record where the time has been a period covering a number of weeks. Under atonic conditions are included relaxed abdominal walls, atony of the intestinal tract, and disturbances of general nutrition. The hypertrophy of Houston's valves, of the sphincter, or of the levator ani muscles, pressure of tumors, accumulations of fæces, and uterine and vaginal displacements are among the obstructive causes. Habit is a matter of great importance, either as a prevention or cause of constipation—sedentary habits, improper diet, irregular time for eating, pernicious drug taking, and failure to drink enough water are the most common.

Diseases of the secretive organs and intestinal tract include chronic affections of the liver, stomach, intestines, enteritis, colitis, and fissure of the anus. Venous obstruction causes hypertrophy of the mucous and submucous coats and impairs peristalsis. Tabes, hemiplegic and transverse myelitis are some of the spinal cord diseases that cause constipation. A very important cause is the formation of a "pouch, changing the direction of the inter-abdominal rectal pressure to that of the vaginal at right angles to it, and making it difficult for the rectal sphincters to relax and void the contents of the bowels." Another classification of causes is included in obstruction of the channel, dryness of the fæces, and differences

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in the functional activity of muscles and motor nerve apparatus of the intestines.

Regarding the causes of atonic and spastic constipation Reed states that "Glénard considered displacements of the stomach and intestines as chiefly responsible, while Emminghaus traces habitual constipation to degenerative changes in the splanchnics, and Dunin thinks it attributable mainly to central functional anomalies in the nervous system. Boas finds it difficult either to deny or confirm these theories, but points out that in any fully developed case of neurasthenia, with constipation, there is likely to be found a vicious circle."

Defecation may be either voluntary or involuntary, the beginning and end of the act being voluntary, while the remaining part of the act is involuntary. An accumulation of fæces and gases presses or stretches the fibers and induces peristalsis.

The sphincter is contracted tonically during the intervals between defecation. The center controlling the muscles of defecation is located in the lumbar enlargement of the cord. The sphincter is also influenced by a cerebral center, located, it is supposed, in the optic thalamus. When the fæces and gases pass from the sigmoid, they stimulate the rectal mechanism, and an impulse to evacuation is induced. According to Kirke, "the stimulus, however produced, is transmitted to the center in the cord through the hemorrhoidal and inferior mesenteric plexus, and is then reflected to the muscles of the rectum through the pudendal plexus, resulting in a relaxation of the sphincter, a contraction of the muscular gut walls, and expulsion of the fæces."

By compression of the abdominal viscera, the fæces are aided in their downward course, when they reach the uppermost Houston valve on the left wall they may rest there, or be pressed onward to the next lower valve on the right anterior wall. The fæces thus gradually approach the anus, during which time the levator ani muscles "draw the canal upward and over them." The levator ani not only thus raise a part of the pelvic floor but prevent distention of the pelvic fascia. Hyrtl says that "the levatores ani are related to the anus like the two cords of a tobacco pouch." It is thought that an inhibitory seat in the brain in the optic thalami allows the fæcal mass to pass through the anus without causing it to close reflexly.

The amount of fæces normally passed in twenty-four hours should be about five ounces and should consist of about seventy-five per cent. water, which depends, according to Landois and Stirling, partly upon the food and partly on the "energy of the peristalsis." When the peristalsis is very energetic, the fæces are more watery, because the fluid from the food does not have time to be absorbed. Landois and Stirling claim that "the quantity of water taken has no effect upon the amount of water in the fæces." It is thought by O'Beirne that when the desire to go to stool is unheeded that the fæces go back to the sigmoid by means of a "reverse peristalsis," but Gant states that his experience is that it is only exceptionally that the fæces are returned to the sigmoid, "in most instances digital examination revealed an accumulation of fæces in the rectum. In a few the earlier examination revealed a like condition, while those made later showed the rectum to be empty." "Again, the lower rectum may be found empty, but proctoscopic examination will reveal the fæces above and supported by the valves, moreover, if the entire fæcal mass is not discharged at stool, the remaining portion may sometimes be seen above the valves."

The effects of constipation are far-reaching, resulting in a degree of constitutional and local disturbance which renders the importance of prompt relief of the greatest consequence.

Heretofore, in the treatment of constipation, too much reliance has been placed on the taking of drugs, which in many instances tend to hasten paralysis, rendering the intestines dependent upon some stimulating influence, which must be constantly increased as well as often changed to be effective, and which, on the whole, has been very unsatisfactory. Too little attention has been given in the past to hygiene, diet, and non-medicinal or mechanical measures. After careful investigation as to the cause, the habits, and diet of the patient, intelligent management will in most cases promptly succeed. The diet must in all cases be promptly regulated to the eating of food calculated to assist peristalsis and of a character that the residue will be sufficient in quantity and of a non-intoxicating nature, not disposed to ferment, and ten to twelve glasses of water daily should be drunk. A regular time of going to stool daily, and a regular time for treatment are imperative. Divulsion of the sphincter is necessary as a preliminary measure in some

cases. In chronic cases, and when impaction is present copious high injections of warm water are advisable, at first daily. Care should be taken that these injections be properly administered, which under no conditions should be left to the patient, as in most cases it will be improperly done. It is well also that the physician instruct the nurse how to administer such injection, for a number of instances have come to my notice where the work has been done in a perfunctory and unsatisfactory manner, which neither redounds to the physician's credit nor the patient's comfort. A colon tube from eighteen to twenty-four inches in length should be employed. About three quarts of warm water are generally necessary, and should be retained as long as conveniently possible. These injections should be repeated daily until there is satisfactory evidence that the bowels have been thoroughly evacuated. A soap-suds enemata or salt solution is generally used for these injections. When soap is employed, green or soft soap is to be preferred, as irritating rashes may appear "on the day following the injection," when hard soap is used, according to Bolton, who makes this statement from a study of 903 enemata.

If the abdominal muscles are lax, exercises should be instituted for development.

It has been a great question among medical men as to what is the best method to use in the treatment of constipation, the bane of woman's life particularly. Many measures have arisen, among the most satisfactory have been dietary, exercise, electrical, and mechanical means. Each has its particular field.

Among mechanical means, the Taylor and Zander machines were the forerunners of the mechanical methods of to-day. They were followed by the use of the oscillator which gives a general vibratory treatment—a passive exercise of the body and the abdomen in particular. Such treatment has proved very efficacious in the hands of some by applying the belt "to lumbar spine, to side, over liver, and to abdomen." The first treatment being from three to five and seven minutes, the stroke being at first six millimeters, and later increased to ten. The motor speed was adjusted to the patient's sense of greatest efficiency which was usually the full rate. Duration of treatment was about twenty-six days.

As the oscillator is made to-day vibratory treatment as well

as an oscillatory treatment may be administered by the same apparatus. Treatment by selective, harmonic electric vibration is also a favored measure used by some, an account of which I will leave to Dr. Morris W. Brinkmann, one of the pioneer investigators of the subject.

The general vibratory treatment which should be instituted on the first day of treatment consists of spinal stimulation followed by an abdominal massage, and in most cases an internal rectal vibratory treatment. Vibratory treatment of the liver and spleen is sometimes indicated.

A vibration is "a recurrent change of position." Vibrations are movements where the recurrent changes of position occurring at equal intervals of time called periods of vibration, which may be infinitesimally short or of sufficient duration to be noted in time, give them the character of waves whose amplitude is very small. The rapidity of the wave transmission is increased with the increase of elasticity of the medium, hence the elasticity of the region treated will influence the effect. Therefore with a given rate of vibration one tissue or organ may have few waves transmitted in a given time, whereas another may have many.

The treatment should be thorough and given systematically with regard to technique. It should be mild at first, then gradually increased in pressure and speed, and finally finished with a diminution of force and frequency. The system of bridging the condition of relief from treatment to treatment, lessening the frequency as the requirements permit, is to be followed.

The patient should be properly prepared. The administrations can be made directly to the skin or over the undervest. It is a waste of time and the unnecessary expenditure of much energy on the part of the physician to attempt to vibrate over the clothing. An interval of rest should follow each part of the treatment.

Moderate pressure is recommended over points or between the transverse processes on each side of the spine, but many factors should be considered before a decision is rendered as to the degree of pressure to apply. Tolerance to pressure increases during an administration and during the course of the treatment. Pressure should be light at first, being gradually increased. Too heavy pressure, especially when pro-

longed, inhibits, and may cause nausea and weariness. Sensitiveness to impression is only an approximate measure of irritability, for, as Luderitz found, the motor nerve fibers are paralyzed sooner than the sensory by continuous pressure, which demonstrates the importance of technique.

A consideration of the subject of vibratory treatment of constipation requires attention to a few details. (1) It is essential that the bladder be emptied before the treatment is begun. (2) If the skin lacks firmness, sponge it gently and quickly with tepid water, not cool enough to shock the system before vibration. (3) If the skin is sticky, owing to excessive perspiration, dust the surface with talcum powder. (4) The application of heat, dry or moist, to a hypersensitive abdomen, before vibratory treatment will make the surface less sensitive. (5) A high enema of warm water and soap-suds preceding the vibratory treatment, is essential in obstinate cases of constipation. (6) Relaxed abdominal muscles necessitating particular attention to position, and deep, regular breathing are also essentials. The treatment should be administered with care to avoid contractions or pain. During the external treatment pressure should be graduated in order to avoid the induction of unpleasant effects. The contra-indications for the employment of mechanical vibration are the presence of cancer or ulcer, acute or febrile states, and a tendency to hemorrhage. It is advisable always to vibrate the spinal nerves, using a ball vibratode, medium stroke, and moderate pressure. The application should be between the transverse processes on each side of the spine, alternately from above downward, about three times. It is thought that the treatment of opposite sides alternately intensifies the effect on nerve centers. It is believed by Schafer that the defecation centers are under control of the sacral nerves, and by others that the lumbar nerves govern defecation. Reed locates the center at the second segment of the lumbar part of the spinal cord, opposite the tenth dorsal vertebra. From the sixth to the twelfth dorsal, inclusive, control inhibition of the small intestine, and the second, third, fourth, fifth lumbar, and the first, second, and third sacral induce inhibition of the large intestine. Second, third, fourth, and fifth lumbar inhibit for descending colon and rectum. The inhibitory nerve of the small intestine is the splanchnic, while the capillaries contain arterial blood; when this changes to ve-

nous the splanchnics are stimulated, and peristalsis is increased. Stimulation of the splanchnics in the dorsal region under the same conditions, and even when general tetanus has been produced by the administration of strychnia, causes an inhibitory effect. The splanchnic supplies motor and vaso-motor nerves to the blood vessels of the intestine and also sensory fibers. Van Bramm Houckgeest says that "the intestines stop moving before the blood vessels contract, so it would therefore seem that the stimulation diminishes the excitability of the plexus myentericus."

If the nervi-erigentes be stimulated, contraction of the longitudinal rectal fibers occurs, and the action of the circular fibers is inhibited, even when the hypogastric nerves by which they are supplied are stimulated, which stimulation has "an inhibitory effect on the longitudinal muscles" (Fellner).

The vaso-constrictors of the jejunum are supposed to be governed by the fifth dorsal. The vaso-constrictors of the colon come from "between the sixth dorsal and second lumbar segment" (Reed), and the vaso-dilators are from the same part of the cord and vagus. The vaso-constrictors of the sigmoid and rectum come from tenth dorsal to fourth lumbar" (Reed).

The vaso-dilators for the same come from the first to the fourth sacral segments. The vaso-constrictors of the small intestine are from the sixth dorsal to the second lumbar through visceral nerves to solar plexus, and thence to duodenum, jejunum, and ileum, the dilators of same come from "nucleus of pneumogastric." Stimuli applied "at long intervals to the nerves act especially on the vaso-dilator fibers, while tetanizing stimuli act on the vaso-motors," which are not so easily exhausted. If the liver be vibrated the following is to be noted: In administering a spinal vibratory treatment we must remember the vaso-constrictors of the portal system are the third, fourth, fifth, sixth, seventh, eighth, ninth, tenth, and eleventh dorsal nerves, particularly the fifth, sixth, seventh, and eighth. If the liver be vibrated posteriorly, apply vibratory friction or percussion in the spaces between the ribs. Interrupted vibration, with moderate pressure and medium stroke, should be used over the liver anteriorly, the flat disk or multiple point vibratode being used. It is well known "that one of the causes of the excretion of the bile is the interrupted periodic compression of the liver from above by the diaphragm at

every inspiration." Stimulation of the spinal cord from which the motor nerves of the larger bile ducts and gall-bladder pass causes acceleration of the outflow, which is afterwards followed by diminished outflow. Direct stimulation of the liver and reflex stimulation of the spinal cord diminishes the excretion. Contraction of the gall-bladder may be induced by stimulation of the ninth and tenth dorsal. The solar plexus and lumbar ganglia may be reached by interrupted vibration. Stimulation of the vagus contracts the stomach and pylorus and induces gastric flow.

In treating the abdomen, apply compressing or deep vibratory friction, employing a multiple point or flat disk vibratode, using a medium stroke for the purpose of relieving intestinal stasis and to assist in dislodging fæces, as well as to stimulate the vascular system.] Begin in such manner as to make pressure over the cæcum, following the course of the colon three or four times, then in the same manner over the transverse colon from right to left, to be followed by vibratory friction from beneath the ribs to the left median line downward and slightly inward, following the colon. It is sometimes necessary, if there be a large quantity of fæces present, to empty the lower part of the bowel as the first step in the treatment. In that event, commence on the left side a short distance from where the former procedure stopped. Use vibratory friction downward and inward six or seven times, then begin higher up and proceed from beneath the ribs downward and inward to the point of termination. Then vibrate the transverse colon, working from left to right, gradually lengthening the line of advance as you approach and pass the median line. Then begin on the right of the median line and apply vibratory friction in the manner described in the preceding description, using deep pressure and moving upward six or seven times, gradually lengthening the line of advance. Extend the vibration lower and lower until the cæcum has been thoroughly vibrated. Finish by a deep circular friction from right to left, moving over the surface several times, like cannon ball massage, using a ball vibratode or the cap shield of some vibrators. The speed should be slow, because parts containing unstripped fibers after being stimulated react "for a long time after the stimulus is withdrawn." But few applications are necessary, for the small and large intestines are easily excited, requiring "no

more stimulus than that of the air to excite them." The second method is preferable for the physician is seldom called upon to treat mild cases.

When administering an internal rectal vibratory treatment the rectal vibratode should be well lubricated and introduced while in motion to avoid shock. Great care must be taken, however, not to overstimulate the intestine; lest dysperistalsis be induced. For "all stimuli applied to the plexus myentericus increase the peristalsis which may become so very violent as to cause evacuation of the contents of the large intestine, and may even produce spasmodic contraction of the musculature of the intestines." The administration should be from three to five minutes, using a short stroke, and a rate of speed which will give the maximum width to the loops that are formed by the vibration of the vibratode. In some cases, the first treatment is made slightly shorter. In very obstinate cases a flexible rubber vibratode, twelve to fifteen inches long, is of service, it being introduced while the patient is in the knee-chest position. Duration of this treatment should be about three minutes, a moderate rate of speed and the shortest stroke being employed. If the stimuli be strong and long continued, overstimulation and exhaustion, otherwise termed "intestinal paresis," takes place, that is, continued congestion of the intestinal blood vessels ultimately causes intestinal paralysis. In using the short rectal vibratode have the patient lie with his back toward the machine, and knees flexed. In some cases the treatment is more easily given when the patient is in the knee-chest position.

These treatments should at first be administered every day for a requisite time until the bowels move regularly, after which administer the treatment every other day, gradually lessening the frequency of the treatment according to the response of the bowels. The majority of cases are practically cured in two weeks' time; in but one instance have I found it necessary to continue the treatment longer than four weeks, and that was caused by indiscretion in diet.

Mechanical vibration in conjunction with dietary measures and in some instances exercise, is the treatment par excellence for constipation. When carefully administered, it is absolutely painless, harmless, and productive of the most gratifying results.

CONSTIPATION—ITS ELECTRICAL TREATMENT.*

BY MORRIS W. BRINKMANN, A. M., M. D., NEW YORK.

A consideration primarily of the indications is necessary to a proper grasp of our subject; this necessarily implies a review of the ætiological factors concerned in this condition.

Causes are (1) of a central character (cerebral); (2) of a central character (spinal), or both together; (3) of a constitutional character, including (*a*) the humoral conditions; (*b*) the dyscrasial; (*c*) the neurasthenia; (4) of a local character.

Lack of nerve force either central, along the track of the nerves.

Either sensory or motor, whether due to impairment or
 1 destruction of histological elements, the development of
 and spasms or spastic conditions in any of the peripheral
 2 apparatus of the splanchnics, the pneumogastric, or the
 cervical or dorsal sympathetic, are sufficient to account
 for constipation.

3 (*a*) Constitutional causes, such as the uric acid, diathesis,
 by neutralizing the normal alkalinity of the succus enter-
 icus and bathing the cells and nerve endings in an ab-
 normal nutritive fluid, is a frequent factor of importance;
 (*b*) cholæmia on account of the stupefying effect of the
 bile salts, necessarily impairs the vigor of intestinal action;
 (*c*) malignant disease is another causative factor; (*d*)
 degeneration of certain varieties; (*e*) elevation of tem-
 perature, in even a small degree, affects adversely inner-
 vation, therefore peristalsis and glandular action, and is
 always associated with cloyness of the mucosa, including
 therefore endosmosis from the fæcal mass and toxæmia;
 (*f*) neurasthenia, implying the lack of nerve control, both
 afferent and efferent; as also deficient cellular activity in
 both the mucosa and muscular layer.

4 Local causes include (*a*) peripheral nerve disturbances;
 (*b*) congestions; (*c*) anæmias, whether due to intra-
 intestinal or extrinsic causes; (*d*) pressure of a mechan-
 ical nature upon the bowel or its vessels or nerves; (*e*)
 strictures or neoplasms of a local character; (*f*) ulcers;

* Read before the 'Clinical Society of the New York School of Physical Therapeutics, Friday evening, October 20, 1904.

(g) foreign bodies; (h) atrophy of the muscular fibers due to lack of sufficient bulk in faecal mass, in turn due to improper food.

Without entering into these subjects more deeply, we have sufficient premises for analyzing the indications for the use of electrical currents to overcome the conditions under consideration; always bearing in mind that prognosis must depend on accurate diagnosis.

The methods employed in diagnosing special causes are too well understood by you all to require review. Special importance, however, must be given to the abdominal examination, and the nervous system. The use of the X-ray and intestinal auscultation are important. A close study of the faeces is of the utmost aid, never forgetting the more general aspects of the subject as a prime requisite to success. My own methods comprise for the treatment of constipation: diet, hydrotherapy, exercise, and electricity. When atrophy of the muscular coat of the intestine exists, the same principles apply as in the striped muscle tissue; without work, meaning, of course, contractions, atrophy advances. When contractions occur regeneration of the muscular coat becomes possible. A coarse diet, therefore, leaving detritus to form a mass, selection being made with care as to the possibility of putrefactive toxæmias. That is we feed not so much to nourish as to develop peristalsis.

The subject and reasoning as to exercise, we leave to the consideration of our colleague, except as to the application of electrical exercise. There are many motor functions within the body, not accessible to the volition of the subject; these can be directly and positively reached by an electrical current. We can cause peristalsis in any degree we wish, from slow to rapid, clonic, or tonic. We can furthermore reach the center, nerve trunk, or periphery, thereby aiding in clearing pathways where there are obstructions to the flow of nervous energy. In congestive conditions we can drain by means of contractions, unattainable in power by any individual. There is no disposition to underestimate the importance of voluntary or volitional exercise. Quite to the contrary, we wish to aid, supplement, in fact, assist it. Hydrotherapy we employ both on account of its demonstrated clinical merit as well as for a long number of theoretical reasons. The clinical thermome-

ter being employed systematically as a guide to our technique. The measures employed are the high hip bath, the abdominal pack, hot hepatic compresses, enemata, rarely ice suppositories; colon washes are not employed.

The liberal imbibition of water is a necessity, the quantity used in many cases, for brief periods, reaching twelve pints in twenty-four hours.

The electrical methods include central galvanization, general faradization, spinal abdominal interrupted galvanic or faradic, lumbro-sacral to rectum applications, either galvanic or faradic. Transverse currents from the two great trochanters. Intra-rectal bipolar faradization. Pneumogastric, epigastric, or rectal. The quantity of current varies in the different procedures, as in all electrical treatments, according to the indications. Intrarectal applications with galvanism are mostly with a milliamperage below five when continued for longer than five minutes, but may reach as high as twenty-five for special purposes. The electrode for the higher milliamperages must be applied with great care, as it is usually employed for strictly local effects of a polar character. Our electrical measures are employed to meet the following indications: To neutralize acid, negative polar treatments—galvanic; for attracting moisture, softening tissue, congesting, negative galvanic; for electrotonic contractions of the galvanic character use negative pole in rectum and interrupt slowly. For condensing tissue, arresting rectal hemorrhage, desiccating a too succulent mucosa, we polarize with the positive at the desired point.

For motor work and the relief of pain the humoric faradic is very valuable. Continuously applied for tetanization, interrupted for clonic contractions.

The sinusoidal current of many cycles per second (above fifty) presents no advantages over faradism. The slow sinusoidization of the faradic current produces the best results. These are unquestioned. They have the advantage of altering the polarization, so that we alternately have nerve periphery and periphery nerve currents. Thus stimulating the normal reflex of apparently primary and efferent secondary impulses. The quantity of faradization must be sufficient to produce contractions.

Painful conditions of the lower bowel or perirectal tissues are perfectly controlled by faradization. One should employ

harmonic combinations of low pitch for the conditions of muscular or glandular atony. For painful conditions of any degree, high pitches, maintained until pain or soreness is relieved. Stricture of the rectum should be treated by the well-known electrolytic methods—negative pole to stricture, milliampere up to five—if necessary ten may be employed; no mechanical pressure on the electrode, recollecting that the current should do the work and not mechanical dilatation.

A spasmodic sphincter is frequently the result of central causes. This should never be forgotten, and the indications met accordingly. Recollecting that the negative pole of the continuous current is the most stimulating, and the positive the opposite.

In malignant conditions I have nothing to offer which is new. Hemorrhoids are successfully treated by positive galvanization with the higher milliamperes, but require careful technique. Fissure and pruritus are relieved by faradization, but do not disappear until the intrarectal conditions are corrected. Eczema of anus, also herpes, are favorably influenced by faradism.

The indications for the static modality are probably by unanimous consent:

First, the wave current; second, the static induced; third, sparks to irritable and sensitive spinal points.

The high frequency currents, whether vacuum electrodes direct from static machine or coil, are indicated for ulcerative conditions of the rectum or anus. The same electrode for painful conditions of rectum or anus, using currents from either the D'Arsonval or Oudin apparatus fed by the coil.

The auto-condensation method or couch presents no special advantages so far known or described in rectal conditions.



EXERCISE IN THE TREATMENT OF CONSTIPATION.

BY WATSON L. SAVAGE, M. D.

It seems to me that the previous speakers have given us quite sufficient information upon the ætiology, pathology, and causes of the subject before us, and I will speak only my experience in the treatment of constipation, principally by exercise. Of course, no man would undertake to treat a given disease without bringing all the knowledge he has to bear upon the subject.

I have invariably begun with habit, and it seems to me that habit being one of the most important things must be created. In order to do this, the time must be selected when the bowels have the most natural inclination. This need not be a regularly specified time on the clock, but a time relative to some living habit, as the time of rising. If the time for soliciting the bowels is the morning hour, I tell my patients that they may choose any time within an hour of the given time, but having passed this period of the day, the bowels must not be solicited. So many times my patients come to me and say, "I had a natural movement, but not at my regular time." I say I am sorry, for all our trouble has to begin over again. Having broken away from my habit I must return again, and find it harder than before.

In relation to this question, I say to my patients: "You are to make your effort and select a time faithfully, but not longer than five minutes." The next day they come to me and say "they have not been successful." I reply, "to-morrow you must make the same effort, and not succeeding, use a glycerine suppository. If you do not succeed then take a high injection of soap and water; you can always get a result in this manner." By proceeding in this way each day, in a short time we get rid of the injection. I sometimes let one day go by, but make sure of the result the next day.

Under no circumstances may we give any drugs. This is imperative and absolute. We can always get our results without drugs. If drugs are taken in any form our difficulties will increase.

The second most important thing is the quantity of water drank. I request them to drink water freely before going to bed and on rising in the morning. The third most important thing, the diet, should be more or less vegetable, and salads treated freely with oil. We all, it seems, agree upon the water and diet. The next factor is exercise, and in this I have experimented in the various forms of exercise that have been practicable. It is not at all uncommon for a patient to come to me and say, "Because I am troubled with constipation, I need exercise." But in order to successfully treat for this condition, we must treat patients individually, not as a class, or we often have active exercise without results. The patient, and often the physician, cannot see why, and they elect to take the class. Later on they say "that it is not doing them any good." I take them and give them specific exercises for their condition, and usually within four weeks, seldom longer than six weeks, a cure is effected.

The exercises I give are directed principally to the movements of the waist and trunk, such movements as will bend or twist the trunk. Such mechanical action is necessary for the action of the fæcal matter in the intestinal tract.

I often invert the patient entirely, hang them head down, and completely suspend them by the hocks by means of a ladder in the corner of a room. But especially useful are the five-leg circles lying upon the back, side right, side left, and face. These circles may also be taken standing. I also give general exercise for the upbuilding of the system. In this way we have cured at least ninety-nine per cent. of all cases in the past fifteen years.



Editorial.

THE STATIC MACHINE AS A SOURCE OF X-RAYS FOR THERAPEUTICS.

A MISCONCEPTION exists in the minds of many as to the reliability of the static machine in X-ray therapeutics. While it is conceded always that in the difficult problems in *radiography* the coil is superior to the static machine, in the *field of therapeutics* it is quite different, as is readily appreciated by those who are familiar with both types of apparatus. Those who follow the foreign notion are in error, because those writers are prejudiced by the fact that in only rare instances have static machines been properly constructed in Europe. With the American static machine, however, which is inclosed in properly constructed cases, and in the hands of operators who are conversant with the proper methods of keeping the interior of the case dry, no difficulty is found in obtaining sufficient current for the production of the X-ray for therapeutic purposes under all atmospheric conditions. Under such conditions this work is uniformly successful in as humid climates as London and Honolulu. No farther argument is required as to the efficiency of static apparatus. The operator with the static machine who is careless in the employment of the X-ray, is brought face to face with the fact that there is no want of efficiency of the X-ray produced by such apparatus, nor does the capacity to produce unpleasant effects demand the most powerful static machine.

X-ray *dermatitis* is the index of efficiency, and occurs after about the same number of exposures when the X-ray is properly employed with either a coil or a static machine.

A *precipitate* induction of dermatitis is rarely so fortunate as to be of the first degree. The inexperienced operator who employs the coil is far more likely to have trouble from this source than the operator who employs the static machine, for unless he is familiar with the fact that the radiations from the coil must be of a moderate degree of intensity, he is apt to produce a very severe condition of necrosis by the induction of a *precipitate dermatitis*, while he is getting the necessary experience.

The fact must be recognized that the *so-called* dermatitis

is properly the sign of *commencing necrosis*, which is certain to follow an injudicious continuance after the first appearance of redness, or too prolonged or too frequent radiations. When from a too energetic employment of the ray, a dermatitis first appears, it is apt to be of a severe type, and may possibly result in necrosis. Dermatitis is therefore the physiological limit for the employment of the X-ray, and when it occurs, from whatever source, is indicative of a sufficient potency in the administration.

The effect upon the tissues underlying the skin is relative to the penetration of the rays and the toleration of the integument, and requires more skill and experience to regulate with the coil than with the static machine.

* * *

THE EMPLOYMENT OF THE ARC-LIGHT AS A PREVENTION TO X-RAY DERMATITIS IN THE TREATMENT OF DEEP-SEATED CONDITIONS.

ONE year's experience in the employment of a thirty-five ampere arc-light, projecting parallel rays from a parabolic mirror, as provided in a marine searchlight, has demonstrated its great value in preventing X-ray dermatitis. Whereas, formerly this condition appeared in from three to five weeks, varying with the resistance of the individual case, it is now possible to keep up the X-ray exposures indefinitely in most cases. The X-ray diminishes the resistance of the skin, and light increases it. If, therefore, it is desirable to produce a profound effect of the X-ray upon tissues beneath the integument, the employment of the arc-light of sufficient intensity, projected against the surface, will restore the resistance of the skin, without diminishing the effects of the ray upon parts beneath.

It is customary to employ an arc of sufficient intensity to produce heat which can be just tolerated over a circle fifteen to twenty inches in diameter, when the patient is placed ten feet from the apparatus, *i. e.*, with parallel rays thrown against the surface. The use of the arc-light is usually begun after exposures to the X-ray have been made on alternate days for about two weeks, and persisted in during the course of treatment to be administered for ten or fifteen minutes following

each application. Under this régime it is possible to keep up practically continuous application of the X-ray without the induction of dermatitis; or, if dermatitis occurs, the skin may be restored to a normal condition in the shortest possible time by this method of treatment. For obvious reasons, the arc-light is not employed over superficial or open processes. It is hardly necessary to add that whenever a dermatitis does occur, even as it may occasionally, during its employment combined with the light, X-ray exposures should be discontinued, and the use of the light persisted in.

The employment of the arc-light in the above manner adds to the possibility of success in the treatment of deep-seated conditions.

* * *

THE DRUG HABIT.

THE human race has been subject for centuries to the notion that the herbs and chemical constituents of the earth should furnish means for the relief of all types of disease. The *bottle*, the *pill*, and the *powder* are inseparably associated with the idea of relieving all complaints. This notion is so prevalent that the tendency by enlightened physicians, who recognize the greater necessity for the removal of causes by the correction of diet and habit, are brought face to face with a demand for drugs. That they are valuable in many cases is not denied, but that the physician should yield to a pernicious demand, and prescribe what is not indicated, is a serious mistake. The members of the profession who persist in giving drugs under such conditions are placing the profession in a false position. The better enlightened members of the community are becoming apprised of this tendency, which must eventually place the profession in a compromising position.

When the profession as a unit, recognizing the inability to cope with certain diseases by drug medication, employ other more rational procedures, and thereby instill correct principles, the public will be led from the foolish notions of habitual drug-taking, which are relics of the past, and the advantage taken by the advertising quack will cease, and the dignified stand of the profession command respect. So long, however, as the medical profession are abettors and substantial supporters of this unfortunate practice the drug habit will dominate.

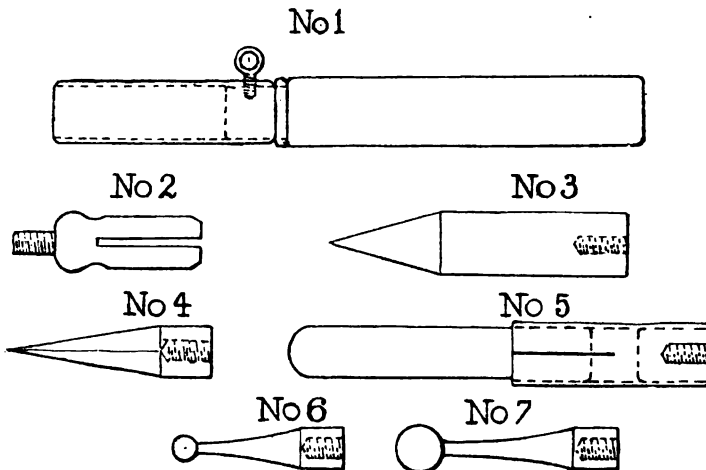
Progress in Physical Therapeutics.

CURRENTS OF HIGH FREQUENCY AND HIGH POTENTIAL.

EDITED BY WALTER H. WHITE, M. D.

Electrodes for Use with High-Frequency Currents. Devised by Dr. Walter H. White.

This set of electrodes are devised for use with the high-frequency machine, more especially the Jackson coil, which admits of the use of either one or two electrodes at the same time on any patient. No. 1 is the handle A, made of rubber, with a metal tube B, at one end for the insertion of No. 2, which is of brass, with a screw at one end to attach Nos. 3



to 7, inclusive. The cord from the coil is attached to the eye in the handle by means of the hook on one end of the cord. No. 4 is a metal point for spray. No. 5 is a metal tube with a split end into which can be inserted No. 3 wood-point or a blunt point of wood, as in No. 5. These, when wet or soaked in water, give a fair spray to be used on sensitive parts, as the face. Nos. 6 and 7 are motor points or small balls of brass. No. 6 is one-quarter inch, and No. 7 is one-half diameter. These are of brass, and should be covered either with punk or absorbent cotton; these are to be thoroughly wet with water and pressed upon the motor point of the nerve. Then the flexible spray electrode which is made

to use with the coil is brought to within about three inches of the muscle, with the current strong enough from one of the secondary coils of the machine to excite a marked contraction of any muscle. In this case the cord attached to the motor point is attached to the ring on the machine marked "Ground," in addition to the "ground wire" that goes from the machine to the secondary coils attached to the pole, which allows of the secondaries being moved to any place in the room away from the machine. The great advantage of using the motor points in this way is that there is no pain, as when using a static machine or the continuous current (galvanic). These motor points should be firmly pressed against the skin and kept wet, so that the current will not jump from the point to the patient. This set of electrodes were made for me by Messrs. Swett & Lewis Co., Boston, Mass.

OPHTHALMOLOGY AND OTO-LARYNGOLOGY.

Otitis Media and Pneumonia.

Acute inflammation of the middle ear is not an infrequent complication of pneumonia. If the otitis has existed prior to the pneumonia, it usually becomes worse, or an apparently quiescent or healed otitis may be revealed by a pneumonia attack (Nathan G. Ward, *Med. News, and Jour. Amer. Med. Ass'n.*, April 30, 1904), as the pneumococcus is far more likely to attack a previously damaged spot as the one of least resistance. There may be a simultaneous affection of both ear and lung. In a few cases the ear symptoms are manifested first, as in the one reported by the author. Otitis may be secondary to the pneumonia, and this relation of the ear affection to the systemic condition is the most frequent. The pneumococcus brought up by coughing enters the naso-pharynx, gains access to the Eustachian tube, extends by contiguity of tissue to the middle ear, and starts up suppuration. This usually occurs when the patient is dull or delirious and may escape the notice of the physician, who attributes the symptoms of cerebral irritation and septic infection to the pneumonia. In one of Stacey Wilson's cases the otitis was revealed at the autopsy, not being previously suspected, and the pathologic changes showed suppurative processes that had evidently existed a much longer time than the pneumonia itself. In the case reported no bacteriologic examination was made, but the author considers that the clinical evidence is in favor of a pneumococcus infection.

Superheated Medicated Air in Diseases of the Ear and Nose.

As a result of his experiments in this line, Dr. Joseph C. Beck (*Laryngoscope*, May, 1903) has found the benefit of

heated medicated air as follows: It stimulates suppuration and helps to throw off pathological processes, thereby producing a healthy surface of healing. It produces epidermization more rapidly. The cavity is dried, and produces a poor culture nidus for bacterial development. The formalin in this gaseous state is forced into all crevices, and exerts its germicidal action more efficiently.

The Relation between Laryngeal and Pulmonary Tuberculosis.

In a series of experiments made in von Mering's clinic at Halle, it was demonstrated, in spite of the fact that dogs proved especially refractory to inoculation with human tuberculosis, that it was possible to induce in this way a tuberculous affection of the larynx. The findings have convinced Frese (Journal Amer. Med. Assn., May 7, 1904) that laryngeal tuberculosis must be generally of sputogenic origin. The sites where it located in the dog corresponded exactly with what is observed in man, and show that the movements of the vocal cord press the sputum material into the mucosa of the larynx. The parts protected by ciliated epithelium and by the secretion of its glands usually escape unless some injury favors infection.

Cough in Children.

When cough in children is of a spasmodic or periodic character, they should always be examined for adenoids, as these are frequently the cause. Fuller (The Lancet, Jour. Amer. Med. Ass'n. May 21, 1904) thinks if the child is not too weak, it should be constantly exercised, and a change of air should be recommended when practicable. It may be all that is needed in the majority of cases. Iron when anemia is present, local extreme reflex irritability and the habit of coughing, and if the treatment of the pharynx by gargles, etc.; sedatives to relieve bronchi are much affected, the ordinary expectorants are indicated. Adenoids or markedly enlarged tonsils should be removed as soon as possible. Carious teeth should be removed, as they are frequently infect the throat.

PHOTOTHERAPY.

EDITED BY MARGARET A. CLEAVES, M. D.

Sensitization of the Skin.

Professor E. Lesser, at Berlin spiethoff, took up an investigation of the above method so highly recommended by Neisser and Halberstaedter, and also practiced by Dreyer as per the current numbers of **ADVANCED THERAPEUTICS**, The pronounced reaction following many cases treated after Dreyer,

he believed to be due to the cumulation of two irritants, viz.: (1) The injection of a fluid (erythrosin); and (2) to the chemically active light energy. His theory seemed to be proven by several experiments on guinea pigs. His clinical experience is based on six cases of lupus. Three of the cases had been treated previously by means of chemically active light, as per the method of Finsen, while the others had not received any treatment at all. His results were so absolutely negative that despite his limited experience he does not expect any good result from this new method of procedure.—Berlin Klinische Wochenschrift, p. 783, 1904.

Radium.

Professor Henry Dixon of the Botanical Laboratory, Trinity College, Dublin, has developed a new field of usefulness for radium. Sections of specimens which are being cut by a microtome become electrified. This is often a source of much trouble to the operator, because the electrification causes the sections to stick to the knife of the instrument and to each other. Because of the ability of the radium radiations to discharge electrified bodies, it occurred to Professor Dixon that they might be utilized to obviate this difficulty. He therefore placed a tube containing five milligrams of radium bromide to the microtome knife, as near as possible to the place where the ribbon of sections formed. The result was most gratifying, as all traces of the trouble were thereby removed.—London Lancet, July 9, 1904.

The Effect of the Rays of Radium upon the Mucous Membrane of the Larynx; a Preliminary Report.

Freudenthal reports a case of tuberculosis of the larynx treated by means of the radiations of a salt of radium, 0.25 grams, contained in a glass tube, and placed in an inclosing receptacle, as per the method of Einhorn. This receptacle is screwed on to a strong probe, and could easily be sterilized. The parts were first cocaineized, then the radium-inclosing receptacle was placed directly over the diseased laryngeal area. The patient learned to hold the end of the probe between her teeth. Twenty to thirty applications were made daily. After two treatments there was a return of vocalization. She had been completely aphonic, but spoke on the third day in a low, though rough and harsh, voice. Under the treatment the right vocal cord became more infiltrated and slight dyspnoea set in. The interarytenoid stalactite excrescences broke down under the treatment, and a large ulceration was present. The granulations which sprang up from different parts of the larynx diminished its lumen materially. This necessitated dis-

continuing the treatment on two occasions on account of dyspnoea. Thirteen exposures in all were made, covering a period of thirteen days. The patient spoke in a loud voice one morning, but the apparent improvement was only subjective, and due to the approximation of the vocal cords under increased granulation. Freudenthal finds these rapidly occurring granulations analogous in one respect to the changes produced by injection of the old tuberculin. In this connection he recalls a case so treated, in which tracheotomy had to be performed on account of the dyspnoea thus produced. Eight weeks after the radium treatment the patient wrote that she continued to feel easier in her throat. The aphonia persisted. The tickling sensation had disappeared to a great extent. No opinion is offered by Freudenthal as to actual pathological change.—Archives of Electrology and Radiology, September, 1904.

RADIOTHERAPY.

EDITED BY J. D. GIBSON, M. D.

A Case of Cancer of the Mamma Cured by Means of the Roentgen Rays. Bulletin of the Johns Hopkins Hospital.

E. Schiff reports this case with diagnosis of inoperable cancer of the left mamma, with lenticular metastasis of the cutis. The left thorax was invaded by a tumor of very large basis and very solid consistency, extending from the left sternal margin to the axillary cavity, where it reached the glands and formed a hard bunch. The surface was ulcerated and exuded a fetid matter. The lower edge showed ten or twelve small tumors slightly bleeding; on the patient's back were five similar nodules. Under the bunch in the axilla was a cavity large enough to hold the egg of a pigeon, the edges of which were gangrenous. Both supra- and infra-clavicular glands were hard and resistant. After the third treatment the pain was very considerably diminished, and the discharge was lessened.

After five months' treatment the writer noticed that, excepting some superficial excoriated parts, a flat scar crossed by some enlarged capillary vessels, had taken the place of the tumor.

The cutaneous metastasis had disappeared, and the group of hard glands in the infra- and supra-clavicular regions were reduced very greatly, and were soft. The general well-being of the patient was very much improved, and the writer was able to demonstrate by histological examination that the diseased tissue had, at the time of examination, almost entirely disappeared.

Epithelioma and Lupus in a Diabetic Patient, Treated with the X-rays. Med. Rec., October 15, 1904.

Dr. Levy Dorn reports a case in which a lupus of twenty years' standing of the buttocks underwent a malignant degeneration and progressed as an epithelioma. For six years the patient had a well-marked diabetes, as much as seven per cent. sugar being found in the urine before dietetic and X-ray treatment was begun. Treatment of the local lesion by the usual means was ineffectual, the ulcer measuring more than two inches either way. Great improvement was manifested at once on the application of the ray, and was followed by a stationary period, then a complete healing of the ulcer, after the treatment had been pushed with sufficient energy to produce sufficient reaction.

The case is interesting in showing the X-ray is as effectual in combating the combination of lupus and carcinoma as it is either of them separately, and that even marked diabetes is no contra-indication to its employment.

The Roentgen Ray as a Remedy in Epilepsy. Archives of the Roentgen Ray, October, 1904.

Dr. Herman Grandt has pointed out the good effect of X-ray in epilepsy applied to the head in early cases. All cases are not amenable to this form of treatment—for instance, those cases in which decided degenerative changes of the brain have set in. "In many cases the epileptic seizure depends on the instability of the brain elements, or on abnormal metabolism. It is accepted by many authorities that the X-ray stimulates protoplasm into greater vital activity." Acting on this theory he has applied the rays in epilepsy. Three exposures are given a week, with a hard tube, at a distance of fifteen inches, exposing a different part of the skull at each sitting. Several successful cases are reported.

HYDROTHERAPY.

EDITED BY CURRAN POPE, M. D.

Twenty-five Simple Methods of Relieving Pain Without the Use of Drugs. By J. H. Kellogg, M. D., Modern Medicine, April, 1904.

In this article attention is called to the various simple hydropathic procedures by means of which pain may be relieved instead of having recourse to laudanum, paregoric, or other opiates. The writer calls attention to the fact that many cases could be relieved by the application of these remedies, while the doctor is being sent for. From among the number we select the following.

The Fomentation.—This consists of an application of cloths wrung out of water as hot as can be borne. If hot water is not at hand, the cloth may be wrung out of cold water and laid upon the stove with a newspaper intervening, or wrapped around a stovepipe.

In an emergency the author prepared a very effective fomentation by putting a large tin dipper over a kerosine lamp and laying a wet cloth over the bottom of the dipper, where it was at once heated. By this means almost instant relief was given a woman suffering from a pain in the head which made her nearly delirious, as the result of an injury received from running against something in the dark.

Fomentations relieve pain not only by drawing the blood to the surface, but by relieving the sensibility of the nerves. Heat often kills pain even more effectively than does opium.

Hot Sponging.—This method is sometimes effective when the fomentation does not succeed. The sponge is dipped in very hot water, compressed to express the water, and gently rubbed over the surface of the painful part. A higher temperature can be employed by this method than by any other. The higher the temperature the greater the effect. For the greatest efficiency the temperature should be high enough to produce a sensation almost painful. It is especially good in cases of neuralgia, particularly of the spine.

Radiant Heat.—This consists of the application of a lighted electric lamp, surrounded by a suitable shade or reflector, to the part affected. It is a most excellent heat to relieve pain. The heat is more penetrating than that from any other source except the arc-light and sunlight. It is a capital means of relieving pain of the spine, various joint pains, and all kinds of neuralgic pains.

Cold Rubbing.—This is an excellent means of relieving certain forms of pain. Neuralgic pains are usually aggravated by this means, but pains due to congestion are usually relieved. The parts must simply be rubbed with a cloth dipped in cold water. The temperature of the water should not be greater than 60°. It is often necessary to continue rubbing for a long time until the surface is thoroughly reddened.

Heating Compress.—Wring a cloth out of cold water and apply over the painful part. Cover with mackintosh, and then with several thicknesses of flannel. The moist cloth will quickly become warm, and will retain heat for a long time. It acts as a poultice, and is fully as effective as a poultice (besides being much cleaner) in deep-seated spinal pains, as found in pains due to indigestion, chronic catarrh of the bowels, and constipation. A heating compress applied to the abdomen will often relieve congestion of the head in headache, and so induce sleep.

The Clay Poultice.—Potter's clay, mixed with water to the

consistency of very thick cream, and applied to the painful parts, often affords relief. This is a most excellent application, far better than bread-and-milk poultices or any similar preparation. Under the name of "Antiphlogistin," a clay paste is sold in many drug stores. Our experience is that this preparation is no better than ordinary clay prepared as suggested.

In making the application the clay is spread over a cheese-cloth or napkin and applied to the affected part. It must be warmed before using. Warming softens and facilitates the application, and at the same time the heat itself helps the effect.

General Hot Bath.—Severe internal pain is best relieved by a general hot bath, which, drawing the blood to the surface, often affords complete relief in severe pains due to gall stones, gastritis, enteritis, and other visceral affections in which pain is present.

The Foot Bath.—The water should be as hot as can be borne. Use 105° to 120°. The temperature of the water can be gradually raised. The deeper the water the greater the effect. The leg bath is still more efficient than the foot bath, but not always so convenient as the hot foot-bath, which may be taken in bed. If necessary, a fomentation may be applied to the feet, but the effect is not so good as that produced by the hot foot bath. It is an excellent means of relieving severe pain in the head, also ovarian and menstrual pains.

Ice Bag and Fomentation.—For toothache, lay an ice bag on the side of the neck under the jaw, and fomentations to the side of the face. If necessary, employ the hot foot bath and the hip and leg pack.

Rest.—Absolute rest of the painful parts is usually necessary. Rest in bed is required for the relief of severe internal pain. In pleurisy pain, rest of the affected lung should be secured by fastening a tight bandage around the lower part of the chest.

"There is one great advantage in relieving pain by this simple means, in that there are no unpleasant after-effects. When drugs are used the cause of pain is not removed, and when the effect of the drug is gone, the patient usually suffers more than before. The simple measures above described relieve pain by removing the cause of it, and so are not followed by any unpleasant reaction."

PSYCHO-THERAPY.

EDITED BY LESLIE MEACHAM, M. D.

Psycho-Therapy in Childhood. By Professor Jules Comby, Physician-in-Chief to the Hospital for Children's Diseases, Paris. Interstate Medical Journal, September, 1904.

Some physicians take advantage of the moral influence that they have over their child patients, though the majority neglect

it. All would be the gainers by using it. Psycho-therapy demands, on the part of the physician, constant good humor, a countenance smiling without effort, an attitude calm but not frigid, firm but not hard. One must be consciously composed without appearing to be so. Adults appreciate these things better than children, but the latter can be affected. Young children should be approached quietly and calmly, with a countenance expressive of kindness and good intent. If persuasion does not succeed, force without brutality must be employed. Directions must be given with authority, with assured voice and precise mien. The promise of immediate relief and early cure comforts the patient and has a very good effect. In the psycho-neuroses psycho-therapy is indispensable and all-sufficient. All manifestations of hysteria may be relieved by suggestion. Even very young children yield very readily. It is slower in neurasthenia, but is successful if used with method and perseverance. Often it is necessary that the child be removed from his immediate family. Psycho-therapy does not exclude other methods of treatment, but may be advantageously combined with rest, dietetics, hydro-therapy, gymnastics, etc.

When an older child shows bizarre symptoms, weakness not to be explained, exaggerated pains, the symptoms must not be taken too seriously. The manner of the physician should not show either too much sympathy or alarm, or the symptoms may be exaggerated in the mind of the patient through a process of suggestion. A slight fall may give rise to a hysterical coxalgia or an astasia-abasia. It should be treated with indifference to prevent his acquiring a neurosis. To give relief, gymnastics and passive exercises may aid the process of suggestion. If the psycho-neurosis has taken form it is more difficult, but success will follow the psychic treatment, though it may require brusque measures or strategy. Cases are cited, showing the relief of supposed injuries by manipulation and suggestion without hypnosis. The author concludes that in this manner all hysterical conditions of childhood may be cured by conversation without the use of hypnosis, bromides, electricity, or douches. The physician must give of his own personality, become the patients' friend, show interest and sympathy. After acquiring an influence over them he can begin to educate their will power, control of actions, ideas, illusions. In order to overcome the tremors, the pains, the paralyses, it is necessary to put in play a psychic force, which exists latent in a brain unbalanced. It is the duty of the physician to reawaken this force in his patients.

SOCIETY MEETINGS.

FOURTEENTH ANNUAL MEETING OF THE AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION, HELD AT ST. LOUIS, MO., SEPTEMBER 13TH AND 14TH, INCLUSIVE, 1904.

MORNING SESSION.

WEDNESDAY, SEPTEMBER 14, 1904.

(Continued)

Nominating Committee.—Dr. Russell Herbert Boggs, Pittsburg, Pa., resigned his membership in the Committee on Nomination. Resignation accepted.

Dr. Herman Grad, New York City, was elected a member of the Committee on Nomination.

Dr. William Benham Snow, New York City, made a motion that when the meeting adjourned, it should adjourn to meet at eight o'clock in the evening.

Motion seconded by Dr. Clarence Edward Skinner, New Haven, Conn., and carried.

WEDNESDAY EVENING, SEPTEMBER 14, 1904, AT 7.30 O'CLOCK.

Dr. Mihran Krikor Kassabian, Philadelphia, Pa., read a paper on "The Value of the Roentgen Ray in the Diagnosis of Fractures."

This paper was illustrated by a number of lantern pictures.

Dr. George Coffin Johnson, Pittsburg, Pa., showed a number of pictures showing improvement in cases of lupus vulgaris, carcinoma, and sarcoma.

Dr. Amedée Granger, New Orleans, La., read a paper on "The Cataphoric Treatment of Cancer."

Dr. Massey showed a number of pictures illustrating the subject of the paper.

Committee on Audits.—Report presented by Dr. Thomas Davidson Crothers, Chairman, who stated that the accounts had been examined and found to be correct.

Secretary.—Dr. Clarence Edward Skinner, New Haven, Conn., read the report of the Secretary.

Dr. Skinner stated that the report of the Treasurer had been forwarded to him, as the Treasurer was ill, and unable to be present, and that the report had been turned over to the Committee on Audits.

The Committee on Nominations presented the following names: President, Dr. Emil Heuel, New York City; 1st Vice-President, Dr. Charles Hamilton Hughes, St. Louis, Mo.; 2d

Vice-President, Dr. Morris Weil Brinkmann, New York City; Secretary, Dr. George Coffin Johnston, Pittsburg, Pa.; Treasurer, Dr. Richard Joseph Nunn, Savannah, Ga.

Executive Council.—Dr. Thomas Davidson Crothers, Hartford, Conn.; Dr. Alphonso David Rockwell, New York City; Dr. Charles Rea Dickson, Toronto, Ont., Canada.

Next place of meeting—New York City.

Dr. George Betton Massey, Philadelphia, Pa.: I would like to supplement the report of the Committee by nominating Dr. Clarence Edward Skinner for Secretary. The nomination was duly seconded.

The report was received, and the Committee discharged.

Dr. George Betton Massey, Philadelphia, Pa.: I move that the nominations made by the Committee be voted upon affirmatively by the Secretary, with the exception of the nominees for Secretary.

The motion was put before the house, and carried. The nominees whose names were reported by the Nominating Committee, with the exception of the name for Secretary, were declared elected.

A vote by ballot was ordered for Secretary.

Dr. Almerin Webster Baer, Chicago, Ill., and Dr. John Nesbitt Scott, Kansas City, Mo., were appointed ballot tellers.

Balloting resulted in favor of Dr. Clarence Edward Skinner, and he was declared elected. The vote was then made unanimous.

Dr. Charles Hamilton Hughes, St. Louis, Mo., stated that while the Committee had named New York City as the next meeting place, yet, inasmuch as the American Medical Association would meet at Portland, Oregon, next year, and as that is the time of the Lewis-Clark Exposition at that place, at that time, he believed it would be wise to hold the meeting there. He expected to go there himself, and believed that there were a number of members who would like to go to attend the Exposition, and to attend the meeting of the American Medical Association. He thought that these circumstances would probably detract a number from the New York meeting. Next year would be the event of this country on the coast.

Dr. Charles Rea Dickson, Toronto, Ont., Canada, made a motion that the question of the place be left to the Executive Council.

Motion seconded, and carried.

Dr. George Betton Massey, Philadelphia, Pa., offered an amendment to the By-Laws to change the designation of Fellows from "Ordinary Fellows" so that same would read, "Active Fellow."

Dr. Joseph Monroe Lieberman, New York City, read a paper entitled, "Locomotor Ataxia Successfully Treated with Ultra-Violet Rays."

Discussed by Drs. Brinkmann, Hughes, Grad, and Lieberman.

Dr. John Holcomb Burch, Baldwinsville, N. Y., read a paper on "Clinical and Experimental Effects of Electrical Currents of High Potential and Frequency."

Discussed by Dr. Brinkmann and Dr. Snow.

THURSDAY, SEPTEMBER 15, 1904, 9 O'CLOCK.

MORNING SESSION.

Thursday, September 15, 1904, at 9.30 a. m., held at the Coliseum in St. Louis, jointly with Section H of the International Electrical Congress. Dr. Wm. James Morton, Chairman. Dr. Morton introduced Mr. Bourgoni of Bordeaux, France, as Honorary Chairman. Mr. Bourgoni made a brief address.

SCIENTIFIC SESSION.

A paper on "Dupuytren's Contraction and Indications for its Treatment," by Wm. J. Herdmann, Ann Arbor, Mich., read by Dr. Skinner. Paper was discussed by Drs. Massey and Morton.

A paper on "Diagnosis of Calculi," by Russel H. Boggs, M. D., Pittsburg, Pa. Discussed by Drs. Hall, Scott, Johnston, Kassabian, Morton, and Snow, and closed by Dr. Boggs.

The Chairman introduced Drs. Samuel Sheldon and Wm. J. Jenks, of the Committee on Current Classification and Nomenclature of the Association, who read the report of that Committee. Discussion by Drs. Morton, Snow, Massey, Sheldon, Grubbe, and Skinner, and closed by Sheldon.

A paper on "Some Observations upon the Treatment of Lupus Vulgaris by Phototherapy, Radiotherapy, and Otherwise," by Dr. Charles Rea Dickson of Toronto, Canada. Discussed by Drs. Grubbe, Snow, Morton, and Baer. Closed by Dr. Dickson.

A paper on "Fluorescence," by Dr. Wm. J. Morton. Discussed by Drs. Spring, Skinner, Grubbe, and Baer. Closed by Dr. Morton.

"A Large Fibro-Sarcoma Treated by Roentgen Radiation," by Clarence E. Skinner, New Haven, Conn. Discussed by Drs. Grubbe, Snow, Baer, and Rogers. Closed by Dr. Skinner.

EVENING SESSION.

Thursday, September 15, 1904, at 8 p. m.

Dr. T. D. Crothers in the Chair. A paper entitled "Diabetes Mellitus, Treated with the Direct Current," by Francis Besant Bishop, Washington, D. C., read by Dr. Snow. Discussed by Drs. Snow and Hoskings.

A paper on "The Importance of Association of Other Physical Measures with Electricity in Therapeutics," by Dr. Wm. Benham Snow. Discussed by Drs. Lurring and Troutman, and closed by Dr. Snow.

(To be continued)

A MEETING OF THE CLINICAL SOCIETY OF THE NEW YORK SCHOOL OF PHYSICAL THERAPEUTICS.

At a regular meeting of the society, a symposium was presented on the Treatment of Constipation by Physical Methods.

Dietetics in the Treatment of Constipation by Sigismund Cohn, M. D.

Mechanical Vibration in the Treatment of Constipation by Arnold Snow, M. D.

Exercise in the Treatment of Constipation by Watson L. Savage, M. D.

Electricity in the Treatment of Constipation by M. W. Brinkmann, M. D.

Dr. Barton in the chair.

Discussion.

Dr. Grad: Mr. Chairman, I have listened with great interest to these papers to-night and learned much about constipation. I do not wish to discuss these papers, but to call attention to a little expedient that is certainly a very valuable therapeutic measure in constipation. Several years ago I was called in to see an old lady suffering from constipation. No evacuations were obtained for six days or more. Enemata and medicines of various kinds had been tried without success. Remembering that I had read in a medical journal of a case of constipation reported from the oil regions, where an obstinate case was treated successfully with kerosene oil, I gave by enema six ounces of kerosene oil as a last resort, before operating. To my surprise, in about six hours the oil came away, and brought with it a large amount of hard fecal matter. This extreme condition of obstipation is only found in old people.

I have had occasion to resort to this little therapeutic remedy, and with excellent results in old people, and in long-standing cases where there are hard fecal masses.

Dr. Titus: I have looked upon constipation as a symptom, not a disease. I feel that our efforts are best rewarded by remedies that supply artificially the normal secretions of the intestines (due to imperfect liver and intestinal activity) such as ext. pancreatin, ox gall, colatin, combined with suitable laxatives. Imperfect mastication of food is a factor in chronic constipation, often due to poor teeth, and many cases are benefited by a visit to a good dentist.

Regular habits of eating must be formed, and avoidance of overeating. The bane of modern civilization, especially in large cities, is over-eating at night with resulting constipation.

Dr. Davis: I think it is a good idea to select for each patient a regular time of evacuation.

Dr. Northrop: I find that drinking water before breakfast is very successful in cases of obstinate constipation.

Dr. Westcott: As I am rather an old practitioner, mechanical and vibration treatments are something new to me.

I fully concur from my own experience with what has been said to-night. Like the poor, we have constipation always with us. There is plenty of room for the good work begun. Thanking you for your interesting papers, and hoping to be with you again, I beg to be excused from further remarks.

Dr. Snow: I have listened with great interest to these papers, and feel, probably from my own personal familiarity with all of the methods, more deeply interested in the subject than those who have not watched the development of these measures.

Constipation generally arises from an absence of the proper stimuli or an overloading of the digestive system with a stimuli not requisite. The measures that are suggested are all stimuli in a way, the regulation of diet by the substitution of food containing more residue, the employment of mechanical vibration, exercise, or electricity, to stimulate the end neurons and give impetus to peristalsis.

Diet, as a means to the end in view, as presented by Dr. Cohn is of the utmost importance, both prophylactic and corrective. The proper food, seasonably taken, together with a correct habit and regulated exercise, are properly the only requisites for the maintenance of daily evacuations.

Mechanical means induce peristalsis acting as local stimuli but tend to a normal condition and not to the establishment of a habit as drugs do. Our efforts ought to be directed chiefly to the best method of overcoming the diseased condition by the regulation of diet and exercise, and the employment of indicated physical measures. In electricity we have the wave current and various other electrical applications, which are successful in giving proper impetus to peristalsis.

Treatment by mechanical vibration by methods recently developed has accomplished a complete revolution in the treatment of constipation. No measure in our experience has been so successful as its employment associated with the static wave current and diet.

Dr. Cohn: I differ from the other authors of to-night's papers in regard to the ætiology of chronic constipation. According to my opinion there exists only one cause for chronic constipation, and that is faults in habit and diet, and it is only in this sense we can speak of constipation as a disease. Constipation from other causes, as Bright's disease, or cerebral

meningitis, or neurasthenia is only a symptom of these diseases, and certainly none of us will try to treat them with diet or electricity. The treatment of a true case of habitual constipation is the correction of the faults in habit and diet, and this will be sufficient in the majority of cases. The mistakes in diet consist in eating too concentrated food, too rich in nutritive material, and too poor in residual matter. The consequence of this is a lack of physiological stimulation of the intestines. There is nothing for the muscles of the bowels to work on, and they become atrophic from inactivity. The object of our treatment is to prescribe food with sufficient bulk to provide the necessary physiological stimulation. Of course, everything can be overdone, and it is possible to give too much bulk in the food; as a consequence, there will be over-stimulation and exhaustion. These are the cases that may occur after a diet too rich in vegetables. In regard to the danger which may arise from the fermentation of the carbohydrates, I wish to say that there is none. It is the putrefaction of the proteids which has to be taken care of, and it has been demonstrated that this putrefaction of proteids is greatly inhibited by just this fermentation of the carbohydrates, due to the formation of free organic acids, as lactic, butyric, and acetic acid.

Dr. Savage: I must congratulate the speakers upon their most excellent papers. The treatment by water, the importance of a selective diet, the formation of habit, and properly applied exercises cannot be over-estimated. That electricity is valuable is a question yet to be determined. I think vibratory treatment merely acts as a stimulus on the parts. I give exercise to stimulate the activity of the function, not for muscular development.

Dr. Brinkman: Life is simply the result of responses to stimuli. The bowel is a machine destined to act in a certain way. The remark made by Dr. Cohn that too much residue may be given is freely admitted. The natural stimulus of the stomach and bowels is food of a certain character.

There must be a certain amount of vigor to do a certain amount of work, and the capacity of an individual may be greatly over-estimated. Despite the words of the last speaker, there is certainly atrophy of the bowel. I agree with Dr. Cohn, I do not think that electrical and vibratory treatment can compare in importance with the dietetic treatment. But there are cases where palliative treatment is necessary.

Dr. Arnold Snow: I congratulate the speakers on their most excellent papers. The points that have been made are of the utmost importance. Too much stress cannot be laid on the amount and time of drinking water, the taking of a selected diet, habit, and the importance of properly applied exercise. The electrical measure is commendable and is directed

along the lines of the application of mechanical vibration. The part that static electricity takes, aside from its mechanical effect, is a question yet to be determined.

Dr. Savage's remarks call for an explanation on my part. I agree with him that muscular development as commonly accepted is of no importance, and the connection in which I used it was in respect to relaxed abdominal muscles, development representing a better tone, better circulation, and response to stimuli. All exercises have their particular adaptability and should be left to the selection of one thoroughly acquainted with the subject and not practiced as fads or used in a perfunctory way. In my work, I constantly use exercises, carefully selected and graded, but only to accomplish certain positive results regardless of beauty or form.

MEETING OF THE FRENCH SOCIETY FOR THE
ADVANCEMENT OF SCIENCE, AT GRENOBLE,
FROM AUGUST 4-11, 1904. Abstract of Proceedings of
the Section on Electro-Therapeutics. From Archives d'Élec-
tricité Médicale. Translated by Amédée Granger, M. D.,
New Orleans, La.

The President, Dr. Bécclère, in his inaugural address, after thanking his colleagues for the honor they had conferred upon him, briefly reviewed the work done by the section since its creation in 1899. He congratulated the members upon their successful efforts to advance not only the science of electrology but also that of radiology. This new science, which had seen the day in the discovery of the Roentgen rays, had made marvelous progress. It had been followed in rapid succession by other important discoveries, the rays of becquerel, radium, and radioactive substances, and lastly the N-rays of Blondot.

The doctor thought that it would be absurd for the present to attempt to state the possibilities or limitations of this new field. He concluded by urging the members to change the name of the section to that of Section of Medical Electrology and Radiology, so as to include this new and important science in which they were all deeply interested, and which could properly be considered a part of electrology.

Roentgen Rays.

A large part of the programme and of the discussions was devoted to radiotherapy and radiography. In the papers and the discussions which followed, almost the entire field of usefulness of the Roentgen rays in diagnosis and treatment was gone over. Coils were employed to excite the tubes in every instance, and were not only considered more reliable, but more precise and scientific than the static, whose current output constantly varies. It was considered that the claims of radiography were unqualifiedly admitted by all to-day. Unfortunately, it was not so with radiotherapy, owing to the many

conflicting reports in the medical literature. This disparity was attributed to the fact that up to this time there was no practical means by which one observer could make certain that he had duplicated the treatment of another, as not only the coils and tubes of different makers, but those of the same maker, gave widely different results. In spite of this, sufficient positive evidence has already been collected to give the Roentgen rays a permanent and prominent place among the useful therapeutic measures. General recognition and uniformity in reports can only be hoped for later, when scientific observers and ethical manufacturers have by their combined efforts been able to furnish the medical profession with coils of a known current efficiency, and with instruments of measurement with which to measure in a practical way the current output of the coil, the equivalent of the parallel spark-gap in the tube, the degree of penetration of the rays, and the number of these rays.

Dr. Bécclère described and exhibited the new chromo-radiometer of Sabaurand and Noiré. The principle of this chromo-radiometer is based upon the observation made by Villard that the color of a barium platino-cyanide screen changes from a light green to a yellowish brown after long exposure to the X-rays. This discoloration disappears, and the original color of the screen is restored after exposing it to ordinary daylight. If we now choose among the brown shades of the platino-cyanide which has been exposed to the rays, that which was produced by an exposure of maximum duration without causing any skin reaction, we possess at once a limit that must not be exceeded, and which becomes a simple and safe guide in the therapeutic application of the rays.

To apply the chromoradiometer of MM. Saboureaud and Noiré it is therefore necessary to have ready several small disks of barium platino-cyanide. (Those used by these gentlemen were five mm. in diameter.) One of these is exposed at the same time as the patient to be treated, but is placed at a distance of eight cm. from the anticathode of the tube, while the patient is placed at a distance of fifteen cm. The change in the color and shade of the disks carefully observed, and the exposure can be continued without danger of X-ray dermatitis until the shade becomes the same as that of the control disk of the chromoradiometer. This is certainly a very simple and inexpensive apparatus.

Professor Bergonié stated that in his clinic he employs two tubes excited simultaneously by the same coil, and had succeeded in exciting as many as four tubes at the same time with one coil. The tubes are connected up in the same manner as incandescent globes are in ordinary house-wiring. To accomplish that result it is necessary that the coil have a secondary wound with relatively coarse wire and be able to deliver a current of

very great intensity. He pointed out the advantages to be derived from this arrangement in overcrowded clinics, where two or more patients could be treated at the same time. He hoped that the manufacturers of electrical apparatus would take up his idea and furnish some practical means by which any one tube could be placed in or out of circuit without disturbing the functioning of the other tubes.

The Treatment of Ozena and Acne by High-Frequency Currents. By Dr. Curchod.

The case of ozena was in a young lady, twenty-three years of age, who had been afflicted with the disease for nine years. She had been under several classical treatments without obtaining any relief. In both nasal cavities there were numerous patches partly covered with a dirty brown crust and partly ulcerated, and secreting a greenish pus which was very offensive and corrosive. The treatments with high-frequency currents were begun at once, and at the end of ten the fetor was markedly diminished. After thirty applications the treatment was discontinued. The nasal mucous membrane had regained its normal aspect but for a few small ulcers, which, however, did not discharge any fetid pus. The treatments consisted in the application of a modification of Oudin's concentrated electrode in each nasal fossa for five minutes.

The second case, one of acne, was a young woman of twenty-eight, whose face was literally covered with comedons, accompanied by numerous pustules. She was cured, and her complexion restored to a normal condition after twenty-two treatments with the high-frequency currents. Applications of six or seven minutes were made to the face three times a week by means of a spray electrode held at a distance of twelve to fifteen cm. from the skin. This patient had also been under several other treatments without being benefited.

The third patient was a case of acne rosacea of the nose, with marked enlargement of the vessels, but without hypertrophy of the tissues. The natural color of the nose was restored and the telangiectasis destroyed by fifteen applications. These treatments consisted in alternating applications with the spray electrode with others made with the concentrative electrode.

Photo-Therapy.

Dr. Bordier reported a case of nævus cured by phototherapy. The patient, a young lady, had several large wine-marks on the right cheek. The discolored tissues were destroyed after three or four applications of an hour's duration made successively to each spot. The doctor used the apparatus of Professor Marie, and believes that the good results obtained were due to the energetic compression which he made with the instrument during the applications. The cure was complete, and the result beautiful, as proven by the photographs exhibited by Dr. Bordier.

BOOK REVIEWS.

WHAT A YOUNG MAN OUGHT TO KNOW.—By SYLVANUS STALL, D. D. Vir Publishing Co., Land Title Building, Philadelphia. Price, \$1.00.

This work in the series of Dr. Stall is another which is a monument to the writer's force of character and good works. Having had the pleasure of reviewing other numbers in this series, we feel that the public are greatly indebted for the labors of such a mind, devoted to a much-needed department of education, for useful manhood. In this work are given chapters upon all subjects relative to Chastity, Continnence, Sobriety, and the Maintenance and Right Use of a Healthy Organism. The writer treats in a delicate manner on the Right and Relation to Women, Marriage, and the Selection of a Wife, considers the discussion of Early and Late Marriages, Weddings, Hindrances to be Avoided, and Helps to be Used. Works of this character are of inestimable value to humanity, and the medical profession can do no better service than to recommend this series for the use of the young people with whom they meet in the professional capacity, for the subjects are treated in a manner which is uncompromising and must conduce to the health and moral improvement of the community.

NEW METHODS OF TREATMENT.—By Dr. LAUMONIER, translated and edited from the second enlarged edition by H. W. SYKES, M. S., M. D., Cantab. Physician to Out-Patients Great Northern Central Hospital. Published by W. T. Keener & Co., Chicago, Ill. Price, \$2 net.

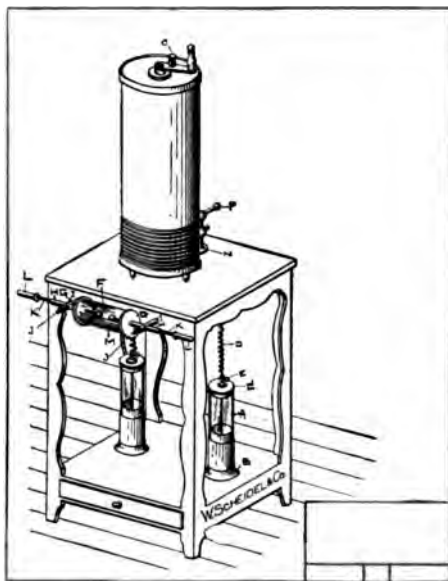
This work is designed to make an easy task for the busy physician in investigating the physiological properties of many of the new remedies and was written at the request of his publisher. The work considers the various properties, under the head of Various Clinical Indications treating of the Nutritive Alterants, Soluble Albumens, Lecithins, Nucleins, and Glycerophosphates, Yeast, etc.; under Blood Alterants, Subcutaneous Injections, Hæmotherapy, Employment of Blood Derivatives, and Substitutes for Iron, etc.; Mineral Medication, Respiratory Alterants, Renal Alterants, Vaso-Motor Alterants, Ovotherapy, Serotherapy and Vaccination, Nerve Alterants, the Antipyretics, and the Antiseptics.

The work contains very much that is useful and practical in these lines of therapeutics and may be read to advantage even by those who may make little use of the measures included.

NEW AND IMPROVED APPARATUS.**THE SCHEIDEL RESONATOR.**

The accompanying illustration represents an apparatus with which the makers have scored quite a success among physicians. The cause for it is well apparent for those who have

had occasion to use it. While not departing in its general arrangements from standard practice, this resonator is built strictly after the principles of Professor Oudin as outlined lately by him; and the makers, Messrs. W. Scheidel & Co. of Chicago, have taken considerable pains to perfect all these small details, which although often and improperly called unimportant, in the course of time prove to be of immense value and convenience to the user. It is evident that in instruments of this class considerable care must be exercised in building as well as in final adjustment, and it is here they excel others by special methods of "tuning," which in turn again are possible only if



facilities and skillful help are united under competent and persistent management. There has been more harm done to new methods and apparatus by blindly copying foreign patterns than our readers can imagine, and we are glad to say that every feature incorporated in the design of this resonator is not only in full accordance with the best present practice, but also well adapted to meet the most severe conditions arising in everyday service. The same care in building is shown in the directions and other instructions sent out with every instrument. These are most clearly and plainly written and are illustrated by numerous drawings and diagrams, and we fail to see how a mistake or disappointment can be met with, as long as these are followed. For this latter point, especially, the makers deserve all credit.

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